THE DOCK & HARBOUR AUTHORITY

No. 105. Vol. IX. JULY, 1929.

Editorial Comments.

CORK AS A FREE PORT.

In view of the agitation to establish a free port at Dublin, the claims of Cork are being advanced in that direction. It is contended that the raising of the Customs barrier in respect of tractor parts consigned to the Ford factory in Cork is a move in that direction, and that Haulbowline dockyard—which has been idle for years—could be used as the "free area." A prominent business man states that there is no demand for a "free port," and that if it was such a good thing, why were not some of the leading English ports "free" in the same sense?

NEW BROMBOROUGH DOCK.

Details of the big dock construction scheme for Messrs. Lever Bros., Ltd., at Bromborough are now available. The dock is situated on the Cheshire side of the river, about midway between the Birkenhead Docks and the entrance to the Manchester Ship Canal at Eastham, and immediately opposite the Dingle Oil Jetty on the Liverpool side of the river. The distinctive feature of the undertaking is that when completed it will provide access to excellent building sites on the dock estate itself, offering great inducements for new and extending firms. The dock will have a deep water area of 18 acres and 2,400-ft. of quays. There will be a depth of water in the dock of 33-ft. at high water on spring tides and of 25-ft. on weak tides. The width of the entrance will be 75-ft. and the lock 160-ft. in length. The dimensions of the dock will thus make it able to accommodate large ocean-going vessels. Centrally situated as the dock is, the Manchester Ship Canal, the Leeds and Liverpool Canal, the Bridgewater Canal, and the others which connect with the Ship Canal, are all within easy reach of the site of the Bromborough dock. The lock will accommodate canal barges and river craft and will be available for them for about three and a half hours ebb. Moreover they will be able to berth outside the concrete river wall on the south side of the dock entrance between tides. The extent of the dock estate, when completely reclaimed, will be 145 acres, with a river frontage of one-and-a-quarter miles, bounded by a solid concrete river wall on the south side of the dock entrance and a wall of sandstone rock on the north side. The estate is already very well served by the L.M. and S. and G.W. Joint Railways and, as extra siding accommodation will be laid down for the special use of the new factories as soon as those factories are completed, excellent railway facilities can be guaranteed to intending tenants. In respect of water for various purposes, the estate will be in a very good position as abundant supplies are available from a variety of sources. To meet the electrical demand a large modern electricity generating station has been erected in an ideal situation in about the centre of the estate, and electricity can be supplied to meet any requirements of industry. Supplies are being taken by large industrial factories, and the power station is being extended at the present time to meet further demands.

A NEW HARBOUR.

Recently the Government of Madras, in response to an agitation carried on by the European as well as the Indian Chambers of Commerce, suspended the work on the construction of the Tuticorin Harbour. Government then directed Mr. R. C. Bristow, Harbour Engineer-in-Chief, to prepare the plans and estimates for two alternative schemes. In accordance with this order the Government has now received from the Harbour Engineer-in-Chief complete estimates for a harbour at Hare Island, and also for a complete harbour at Tuticorin. The Hare Island harbour is estimated to cost Rs.120 lakhs, including the expenditure incurred up to the present and for the completion of the whole scheme, while the harbour at Tuticorin will cost Rs.152½ lakhs. These estimates have been sent up to the Port Trust Board, who are requested to hasten the consideration of the estimates so that they may be referred to an expert committee in England, who will decide whether the estimates are sound and workable. Mr. Bristow has raised two points in the estimates. In the first he seeks the opinion of experts whether a more powerful dredger than the one in use is necessary, and what should be the design of the wharf walls.

THE PORT OF BORDEAUX.

Owing to ever-increasing traffic at the Port of Bordeaux, it has been found necessay, recently, to carry out vast improvements at this port to cope with this increase, and these latest developments form the subject matter for this month's Supplement.

In the first instance, it was found necessary to speed up traffic and for this purpose new cranes are being installed and hydraulic cranes at present operating are being replaced by electric ones. New sheds are also being constructed both for passengers and cargo.

It has also been found necessary to greatly increase ship repairing facilities, and for this purpose three new floating docks are being built. One floating dock of 25,000 tons is already in commission at Bordeaux, and, together with the other three, will vastly improve accommodation for repairs.

The Bassens piers, which were hurriedly built during the Great War, are being rebuilt and will be completed in about two years' time.

These latest developments, when completed, should greatly enhance Bordeaux as a port of call, and, undoubtedly, within a very few years, even these additions will be found insufficient to cope with the cargo traffic which will, without doubt, be continuously on the increase.

A detailed and illustrated article appears on another page.

INSTITUTE OF TRANSPORT: ELECTION OF OFFICERS 1929-30.

The undernamed have been elected by the Council to take office on October 1st, 1929:—

President: Sir Josiah C. Stamp, G.B.E., D.Sc., LL.D.

Vice-Presidents: A. L. Barber, R. Bell, C.B.E., S. E. Garcke, R. J. Howley, C.B.E., Sir Alfred Read, H. A. Watson, C.B.E., M.V.O.

Past Presidents to serve on the Council: Sir Lynden Macassey, K.B.E., D.Sc., LL.D., Sir Joseph Nall, D.S.O., T.D., R. H. Selbie, C.B.E., Roger T. Smith, Air Vice-Marshal Sir Sefton Brancker, K.C.B., A.F.C.

Hon. Treasurer: Sir Henry P. Maybury, G.B.E., K.C.M.G., C.B.

Hon. Librarian: G. Ellson, O.B.E.

Messrs. Joynson-Hicks and Co. will continue to act as the Advisory Solicitors of the Institute.

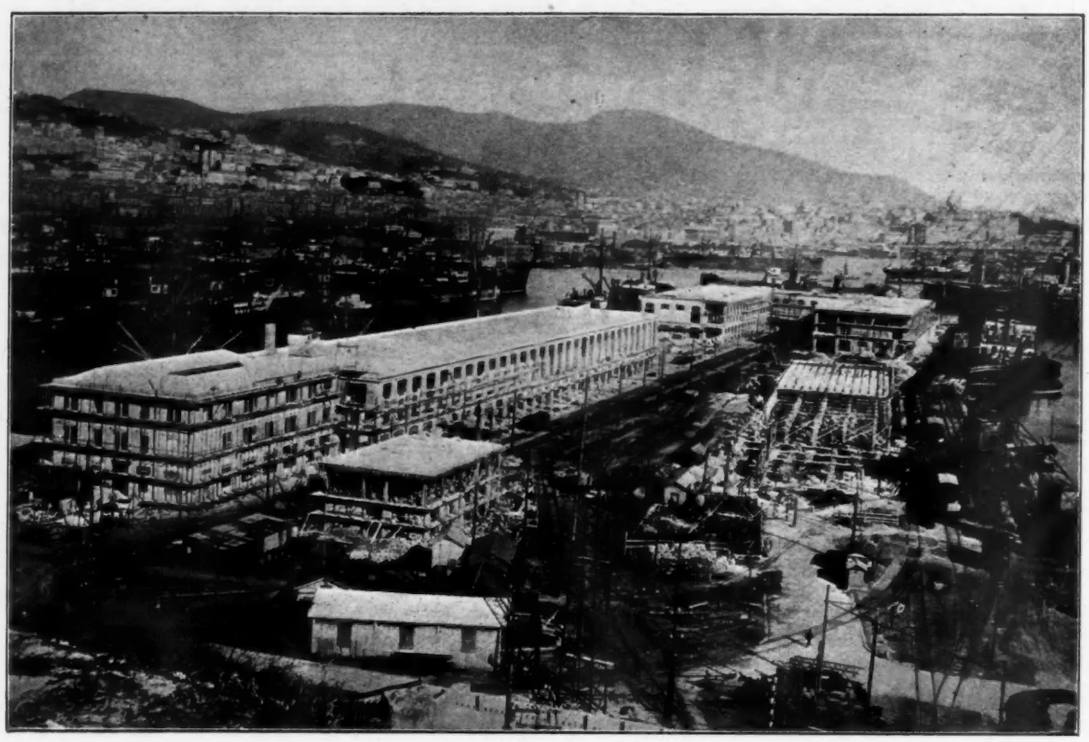
PORT OF SUNDERLAND.

The River Wear Commissioners, Sunderland, have issued a brochure on the Port of Sunderland, mainly for the purpose of the North-East Coast Exhibition.

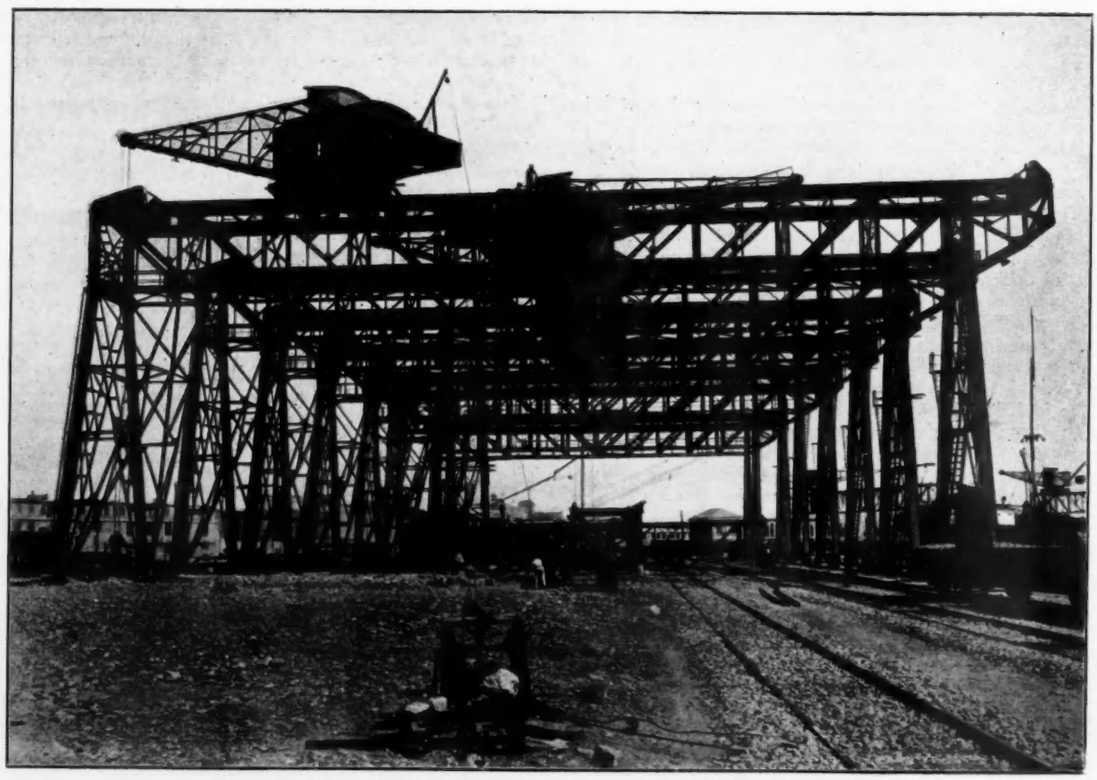
The brochure is very well produced, and the illustrations give a very vivid description of facilities at Sunderland.

Descriptions of the various docks at Sunderland, together with the principal trades carried on at the port, are also fully described. Copies of this brochure can be had on application to the River Wear Commissioners, Sunderland.

The Development of Italian Ports.



Warehouses for Export Trade on the "Ponte Caracciolo," at Genoa.



Electric Elevators in the Bacino Mussolini, at Genoa.

The Development of Italian Ports.

AN idea of the development of shipping at Italian ports might be had from the following figures regarding the statistics of traffic during the first four months of 1929:—

January—April, 1928.—Arrivals, 8,846,245 tons; clearances, 2,467,737 tons. January—April, 1929.—Arrivals, 9,010,522 tons; clearances, 2,681,363 tons.

In connection with the position of the various ports, shipping at Venice and Trieste, the two main harbours of the Adriatic, included the following items from January 1st to April 30th, 1929:—

VENICE.

January—April, 1929: Goods unloaded, 783,218 tons, as against 805,746 tons in the corresponding period of 1928, a decrease of 22,528 tons. Goods loaded: 142,293 tons, as against 93,213 tons, an increase of 49,080 tons.

Total traffic thus shows an increase of 26,552 tons, which assumes a particular importance taking into consideration the fact that it is due practically entirely to the exports, showing, firstly, the interest of Italian exporters to use this harbour for their overseas trade, and, secondly, the growing importance of the industrial zone of the harbour at Marghera. It is proved in this respect by the decision of the Ministry for the Communications deciding to place the new harbour under the jurisdiction of the Provveditorato del Porto controlling the old part of the Port of Venice, this also being a recognition of the good work done by this organisation in connection with the revival of shipping at Venice.

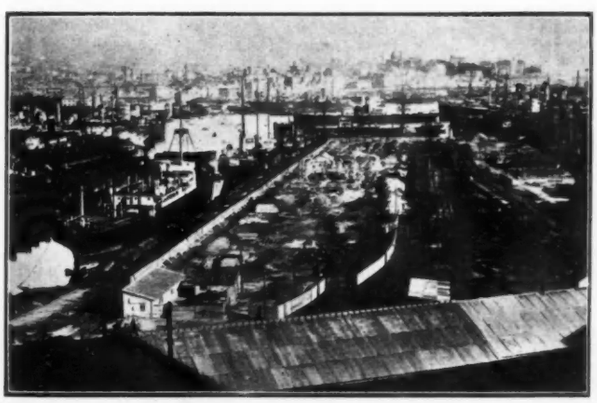
It should be noted in this connection that the increase of exports from Venice does not appear to be a mere temporary development, since during the first four months of 1929 the increase reached 49,080 tons, whilst the corresponding period of 1928 showed an increase of only 32,000 tons in respect to the same period for 1927.

The attraction which Venice presents for international pleasure cruises has caused a big number of large liners to call and has forced the authority to consider the opportunity of increasing the depth of the water, both in the San Mark's Basin and in the Giudecca Canal connecting the basin with the main part of the harbour.

Another problem which has been settled is the question of signals during fog, which, last winter, much delayed several passenger ships. A special lighthouse has been placed at the breakwaters of the Porto di Lido to counteract the delay.

The electrification of the railway from Bolzano to Brennero, which has just been completed, will undoubtedly favour the development of trade between Venice and its foreign hinterland as the trip has been much shortened.

The statistics concerning the development of shipping at Trieste are as follows:—



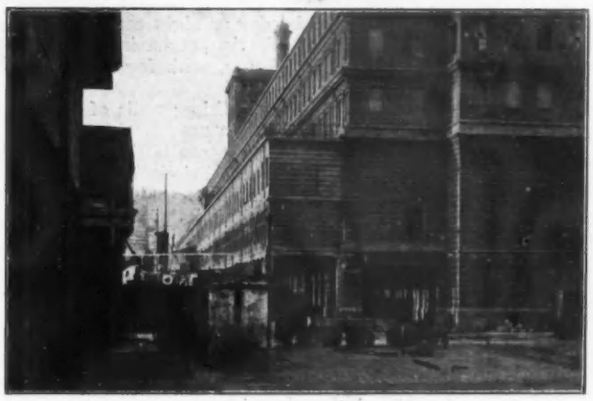
Warehouses for Exports under construction on the "Ponte Ossereto," in the Port of Genoa.

TRIESTE.

January—April, 1929: Goods unloaded, 703,110 tons, as against 528,455 tons for the corresponding period of 1928, an increase of 174,655 tons. Goods loaded: 270,151 tons, against 242,238 tons for the corresponding period of 1928, an increase of 27,913 tons.

It should be noted that while exports from Trieste have usually shown a larger increase than those through Venice, this year the position has fully changed. It is understood that the Ministry for the Communications has informed the authorities in Trieste that the electrification of the railways connecting the port with the hinterland will be initiated in the course of the next few weeks.

In connection with the development of Italian harbours it should be noted also that the Consiglio Provinciale dell'Economia at Rome (Chamber of Commerce and Industry) has discussed the question of discharging coal at Civitavecchia. It should be remembered that not long ago the question was raised regarding congestion in this harbour; the Italian State Railways are using Civitavecchia for the import of coal for Central Italy. The owners have always claimed that time for demurrage should count from the moment the ship has obtained permission to enter the port from the Custom's authorities, while receivers have insisted that time should count from the day the ship has obtained a place to unload. Owing to the quayage at Civitavecchia not being very large, this question has caused hindrance to trade, but now the Consiglio Provinciale dell'Economia at Rome in the jurisdiction of which Civitavecchia is included, has recommended that suggestions should be made in a full report in regard to this, in order to put an end to this state of affairs.



Grain Silos at Genoa.

But the most interesting item in connection with the development of Italian harbours is undoubtedly the project of extensions which has been worked out at Genoa, where it is expected that shipping in that port will reach from 11 to 12 million tons yearly by 1933. At present, traffic in the port of Genoa has reached an average of 850 tons of goods per metre of quayage against 250 tons at Hamburg, 360 tons at Antwerp, 400 at Marseilles, and 220 tons at Liverpool. This figure is undoubtedly the highest that has ever been reached, and shows that if traffic would even temporarily increase, the situation would become rather difficult. This is the reason why—at one of the last meetings of the Consorzio Autonomo del Porto di Genoa—Admiral Cagni, the President of the organisation, suggested an increase of quayage. Even if the Mussolini dock would be completed—he said—the situation would not change much, as we would have about 10,800 metres of quayage, which, when shipping reached 11,000,000 tons, would mean 1,000 tons of goods per metre, thus causing congestion. In order to reduce this traffic to a reasonable figure, we would require, he continued, at least 14,000 metres of quayage. This is the reason why—he concluded—I have submitted to the Government the project for the enlargement of the port of Genoa to the mouth of the Polcevera, and I have obtained the appropriate funds for this purpose through a reduction of the interest which the Consorzio Autonomo del Porto di Genoa has to pay to the Government on the loans made for previous works. In order to establish at Genoa the same proportion as in Hamburg for each metre of quayage the Consorzio Autonomo del Porto would require 28,000 metres and not 14,000 metres of moles, docks, etc. However, if it is decided to reach this result, or that the trade will increase, it is certain that sooner or later it will be necessary to reach even more than 28,000 metres of quayage, and this is the reason why Admiral Cagni has taken the appropriate steps to work out the project of the extension of the port up to Voltri.

In the meantime the Consorzio Autonomo del Porto is working very hard to increase the daily quantity of goods which can be unloaded from a ship during a day: it has been possible to reach a maximum of 3,000 tons of coal, and an average of 2,000 tons, while the general quantity of wheat and cereals has been about 6,000 tons. These results have been made possible through the following unloading facilities:—

44 electric coal elevators: 19 of 5 tons, 21 of 4 tons, 4 of 3 tons. 66 electric cranes: 2 of 1 ton, 41 of 1.5 tons, 22 of 3 tons, 1 of 6 tons. 81 hydraulic cranes: 68 of 1.5 tons, 3 of 2 tons, and 10 of 3 tons; besides several hand cranes, etc.; but these facilities are still to be increased during 1929, as the Consorzio Autonomo del Porto has under construction 16 electric cranes of 3 tons, 6 of 1.5 tons, 1 of 6 tons, and 1 of 10 tons.

However, correspondingly with the increase of unloading facilities, the Consorzio Autonomo del Porto is also watching with interest the question of goods unloaded from ships and transported by railway, and it is felt that the present capacity of 4,000 cars per day is insufficient to meet the requirements of the trade, and, therefore, it is recommended that another direct line from Genoa to Milan be constructed.

Irish Harbour Matters.

TWO MILLIONS SPENT ON DUBLIN PORT.

Since 1869, when the Dublin Port and Docks Board obtained an Act empowering it to borrow money for the improvement of the port, a sum of two millions has been spent in providing improved berthage and in deepening the river channel and bar.

This statement was made at the Dublin Rotary Club by Mr. P. H. Lawrence, of the Dublin Port and Docks Board. Fifty years ago, he said, vessels now considered small were obliged to anchor in the bay, discharge some of their cargo into lighters and then come up the river to discharge at Dublin quays.

To-day, as a result of deepening of the Bar and river channel by the Board, vessels drawing up to 30-ft. of water can come in at high tide, and berthage accommodation is available where a vessel can be afloat drawing 32-ft. The Bar is navigable over a width of 1,000-ft. at entrance, and is buoyed and lighted on a generous scale, making access by day or night easy. In this connection the Board have the distinction of having provided the first completely automatic lighthouse, with fog signals, in the world.

Mr. Lawrence went on to say that the river walls of the old Dublin quays which were originally laid on gravel, with virtually no foundation, have been rebuilt on the south side from the extreme point of the south wall at Great Britain quay to Butt Bridge, with a varying depth of from 22-ft. to 16-ft., and on the north side the entire river wall from North Wall extension up to the B. and I. berth at Commons Street has been rebuilt and deepened, a depth of from 19-ft. to 17-ft. being now available at low water.

NORTH WALL EXTENSION REBUILT.

The North Wall extension has been rebuilt, giving a depth at low water on the river side of 20-21-ft. and on the Alexandra Basin side of 22-ft. to 26-ft., while on the opposite side of the Basin, at Alexandra Wharf, there is a depth of water from 32-ft. to 18-ft. The entire north side of the Alexandra Basin, roughly 50 acres, has been reclaimed and is producing a very substantial rent, which fully justifies the Board for the expense incurred. A further 50 acres is being reclaimed, and in a few years a considerable number of sites will be available for factories or warehouses.

Dublin, as was its birthright as the capital city of Ireland, has since the Treaty assumed a new status. The seat of the Government of the country, it has become more than ever before the centre of the trade and commerce of Southern Ireland. The Dublin Port and Docks Board, fully realising the importance of Dublin as a port of discharge for ocean-going steamers from all over the world, spared no effort in recent years to accommodate all vessels and to cope with the increased trade that has already shown strong signs of materialising.

The Board has already constructed, at considerable expense, an additional deep-water berth (with railway connections) 600-ft. in length; this is being extended by a further 800-ft. at a cost of roughly £100 per foot, which will be capable of accommodating vessels drawing 35-ft. at low water, and has also provided eighteen two to four ton electric cranes, etc., for the more rapid discharge of cargo, and one electric crane of 100 tons capacity.

BONDED STORES.

As was inevitable in a new State, the Board had to provide increased storage for bonded goods. In this connection a modern warehouse with electrical appliances and having a storage capacity of about 2,500 hogsheads of tobacco, has been erected at a cost of £15,000, and an additional warehouse with accommodation for over 3,000 hogsheads is in the course of construction and nearing completion at the Custom House Docks. Besides this, there is accommodation in the existing warehouses of the Board at the Custom House Docks for 40,000 casks of wine and spirits, 22,000 tons of grain, 6,000 hogsheads of tobacco, 10,000 tons of general merchandise, in addition to wharfage accommodation for 30,000 tons of coal.

TRAFFIC PROBLEM.

To meet the traffic problem the Board in recent years acquired land from property holders and widened the north quays for a considerable length, and, with a view to giving freer movement of traffic between North and South Quays, the Board has obtained an Act empowering it to replace Butt Bridge, a main artery, but very narrow, with a modern fixed bridge with space for four lines of traffic, and also to construct a transporter bridge lower down the river at Guild Street.

To show the steady increase in the trade of the port it only needs to give the tonnage entering the port in 1921, which was 2,024,832 tons, and compare it with 2,582,681 tons in 1928.

FACILITIES.

The facilities of the port may be summarised as follows: Three miles of berthage with varying depths of water up to 32-ft. which can be increased to 35-ft. Modern facilities for discharging and loading, including the oil suction pipes of the various oil companies, and the grain suction pipes of the Merchants' Warehousing Company. Sheds for accommodation of goods in transit, with a cubic capacity of 2,300,000-ft. Goods are allowed to lie in these sheds for seven days free of rent. Direct rail and canal communication with all parts of Ireland. Ample warehousing accommodation (including cold storage provided by the Merchants' Warehousing Co. and the National Ice and Cold Storage Co.).

FINANCE.

Up to the year 1898 the Board could only raise money for the improvement of the port by the issue of short-term mortgage bonds, a troublesome, and, from a financial aspect, undesirable method of raising money.

In the year 1898 the Board obtained an Act under which power was given to issue a long-dated stock, but as under the terms of this Act and the Act of 1902, stock could only be issued at a price not less than 90, and the rate of interest paid on the first issue of this stock, 1899 (3¼ per cent.) governing all subsequent issues, the Board found it impossible to get stock out at a price which would only give a return of, roughly, £3 11s. per cent. It was only in the year 1920 that an Act was passed empowering the Board to issue stock at any price and at different rates of interest, and since then the Board are converting all the short-term bonds as they mature into 5 per cent. Dublin Port and Docks Board Redeemable Stock, 1962—1985; the first issue of this stock in 1925 was at £87 10s., and since then it has been quoted as high as 97. This stock is a Trustee security in the Irish Free State, and is regarded as a first-class security. The total debt to-day is, roughly, £1,100,000, an insignificant sum when the value of the Board's property is taken into account.

The number of persons employed by the Board, said Mr. Lawrence, is, roughly, 700, and the sums paid in salaries and wages is over £100,000 per annum.

Mr. Lawrence concluded by expressing himself strongly in favour of the establishment of a free port in Dublin.

COLD STORAGE IN LIMERICK.

The erection of cold storage premises for butter and eggs at a cost of £4,000, is now engaging the attention of the Limerick Harbour Commissioners. In a port which is the natural outlet for a large dairying area, such accommodation is regarded as essential. The proposed scheme is supported by officials of the Irish Associated Creameries and the Department of Agriculture. The building would provide storage for 300 tons with suitable sub-divisions. Before committing itself, the Limerick Harbour Board is making inquiries with regard to leasing the premises to one of the shipping companies.

WIDENING NORTH WALL, DUBLIN.

In a report to the Dublin Port and Docks Board, Mr. Joseph Mallagh, engineer, stated that it is desirable to proceed with the erection of the new frontage wall where the North Wall is to be widened opposite Messrs. T. and C. Martin's premises. In this connection the Board have agreed to pay £9,500 compensation to Messrs. T. and C. Martin.

A FLOATING BALLROOM.

The hulk of the dismantled No. 3 dredger is to be lent to the Dublin City Commissioners for the purpose of a proposed floating ballroom on the river during Civic Week.

OIL STORE SITES: PRIORITY CLAIM.

The Dublin Port Board have approved of their Finance Committee's recommendation "that, subject to Law Agent's approval, one acre be leased to Russian Oil Products, Ltd., at a rental of £200 per annum for a period of 99 years."

The Engineer, in his report, stated that the site for oil storage required by this firm would be available about the first week in July.

Mr. Byrne declared that an earlier application for this site had been made by Dandy Boot Polish and Dandy Garage Co., Ltd., and that they should have priority. It would be an injustice if they did not get the available site for oil storage now. He moved that the Finance Committee's recommendation be referred back.

Mr. Crowe seconded, and said it had been the practice of the Board to grant applications in the order in which they had been received.

Mr. Hewat thought they should go on the broad principle of what was best for the port. There were various alternative sites available for a boot polish factory.

Mr. McGloughlin said that the ground had been pegged out with red flags, and a plan of the site given to Russian Oil Products, Ltd.

The chairman, Mr. P. J. Lawrence, said that the R.O.P. had been given to understand they would get the site, and they could not go back on it now.

On a division, Mr. Byrne's motion was defeated by nine votes to six, and the Finance Committee's recommendation adopted.

TWO ELECTRIC CRANES FOR DUBLIN.

The Dublin Port and Docks Board have arranged to purchase two four-ton electric cranes.

Auckland Harbour Board, New Zealand.

Superintendent's Annual Report.

During the year ended 30th September, 1928, the Board still felt the effects of the Dominion's adverse trade balance through over-importation in previous years; but the revenue and trade returns show that the Dominion was rapidly returning to normal conditions. This recovery is markedly shown in the greatly increased exports from the Province through the Port of Auckland.

TRADE OF THE PORT.

The shipping and goods returns show that, although there was still a decrease in the goods imported, there was an increase in the tonnage of shipping and in the quantity of goods exported. The shipping returns are now being kept so as to show the registered tonnage under each flag (i.e., the country of registration); and it is interesting to note that of the 452 overseas vessels which entered the port during the year, 437 (or 96.68 per cent.) were British owned.

The total cargo, inwards and outwards, handled at the Port of Auckland was 2,054,110 tons, and at Manukau, 53,165 tons. The intra-harbour traffic (exclusive of goods carried by the vehicular steamers, of which there is no record) amounted to 23,698 tons at Auckland, and 74,982 tons at Manukau; making the total cargo handled 2,077,808 tons at Auckland and 128,147 tons at Manukau.

Comparison with the figures for 1927 shows that the principal increases and decreases (in round figures) were as follows:—

AUCKLAND HARBOUR.

IMPORTS.

Increases.	Tons.	Decreases.	Tons.
Fruit	2,500	Cement	15,900
Kerosene	3,000	Coal	15,000
Artificial manures	40,000	Flour	2,900
Produce	21,500	Timber	9,200
Firewood	1,300	Wines and spirits	2,200
Sand and shingle	9,400	Maize	1,100
Sleepers	6,200	Goods (n.e.i.)	4,800
Vehicles	1,300		

EXPORTS.

Increases.	Tons.	Decreases.	Tons.
Fruit	1,700	Cement	3,200
Meat (frozen)	4,400	Coal	2,400
Meat (preserved)	900	Artificial manures	7,400
Skins (sheep)	1,800	Produce	1,400
Sugar	1,600		
Goods (n.e.i.)	2,400		

At Manukau, increases were shown in the exports of 7,089 tons, but decreases in the imports of 2,000 tons.

The figures supplied by His Majesty's Customs show that the total value of goods imported was £14,662,116, and of goods exported £14,133,707. Compared with the returns of the previous financial year this shows a decrease of £1,028,805 in the imports, but an increase of £2,126,549 in the exports.

The value of goods exported is a record for the port.

The treasurer's statement for the financial year shows that the Board's financial position continues to be sound. The surplus for the year in Revenue Account was £44,824, and the net surplus, after making provision for Sinking Funds and other Reserves, £3,827.

The statement is often heard that the Board is a very wealthy body, and whilst that may be true as regards its assets, it cannot be too strongly emphasised that the Board does not seek to make large yearly surpluses, but is content if its revenue account only just balances.

The surplus of assets over liabilities is shown as £2,340,611. This does not include increments in the values of the Board's properties and leases, which, except in one or two instances, have not been valued since 1922.

ELECTIONS.

There were no Harbour Board elections in 1928. Some changes, however, took place in the electoral districts; the Borough of Avondale, previously combined with the County of Waitemata, becoming merged in the City of Auckland.

Mr. H. R. Mackenzie was elected chairman of the Board for the seventh year in succession, and now holds the record for continuous service as a member of the Board (16 years). Mr. Mackenzie has intimated his intention not again to stand for election as chairman, and none will regret his decision more than those members of the Board's staff who have been in close contact with him during his term of office.

Mr. M. H. Wynyard was elected deputy chairman for the fifth year in succession, and acted as chairman during the eight months that Mr. Mackenzie was absent on a trip to Great Britain and the United States of America.

MEETINGS.

Twenty-nine ordinary and special meetings of the Board were held during the year, the average attendance of members being eleven, and there were twenty-six meetings of the Board in Committee with an average attendance of ten. There were also 93 meetings of other committees.

Leave of absence for nine months to enable them to visit Great Britain, etc., was given to the chairman, Mr. H. R. Mackenzie, and to Mr. F. A. Hellaby.

BY-LAWS.

A number of amendments to its By-laws were approved by the Board during the year, and two special meetings for their adoption were held. These amendments provided for: (1) revision of storage charges on goods (allowing three nights' free storage on transhipments instead of one as previously); (2) increase in wharfage on baulk timber; (3) prohibition of gambling in the waterside workers' waiting room; (4) restriction of movements of hulks, etc., in the Ferry Basin. At the same time a resolution was passed instructing the Harbour Master not to berth vessels with bulk cargoes at Prince's Wharf unless under exceptional circumstances.

Other by-laws in regard to (1) regulations in regard to use of gridiron, Nelson Wharf; (2) interpretation of "explosives" and "petroleum"; (3) reduction in charges for use of monorail cranes; (4) limitation of Board's liability for goods on storage; (5) controlling speed of vehicles on wharves; (6) reduction in wharfage on agricultural lime; (7) cancellation of carriers' licenses for breaches of "The Crimes Act," etc., were approved, but were not adopted until after the close of the financial year.

The Board also desired to enact by-laws providing for (1) compulsory lighting of hulks moored alongside other vessels; (2) prohibition of smoking on vehicular steamers; and (3) compulsory use of silencers on outboard motors; but found that it was not empowered to deal with these matters by by-law. The Marine Department, however, promised to issue general harbour regulations to meet the Board's wishes.

LAND.

A sub-division of the area between Quay, Sturdee and Hobson Streets, known as the Old Dock Site, submitted by the Board's surveyors, Messrs. Harrison and Grierson, was approved, and the land was brought under "The Land Transfer Act." A portion of the area comprising 15 sections was reserved for the Board's own use in the future, and the balance, comprising 16 sections, was put up for lease by public tender on conditions approved by the Board.

Small reclamations at Chelsea and at Waiuku owned by the Board were also brought under "The Land Transfer Act"; whilst the conveyance of land to the Takapuna Borough Council (authority for which was given in "The Auckland Harbour Board Empowering Act, 1926") was completed.

LEASES.

Arrangements were finalised with Messrs. Yates Bros. for the lease to them of about 180 acres of tidal lands at Karaka, Manukau Harbour. The firm intends to close the inlet with an embankment and utilise the area for agricultural purposes.

The tender of the Texas Co. (Australasia) Ltd., for the lease for 50 years of a block of eight sections on Freeman's Bay Reclamation was accepted and the layout of their installation of bulk oil tanks was later approved by the Board. The area taken up does not give room for expansion, and the company has expressed its intention to take up a larger block on Western Reclamation when that area is available for lease.

Several other sections on the Freeman's Bay Reclamation were leased, and only eight sections (approximately 1½ acres) now remain unleased out of the whole area of 67 acres.

An arrangement was come to with the Railway Department whereby the Department was permitted to occupy the whole of Block XXVI on the Eastern Reclamation on condition that it contributed the sum of £4,000 towards the cost of making the street fronting the block.

RATES ON RECLAMATIONS.

The long-standing claim by the Auckland City Council for rates on the Board's unleased reclaimed lands was settled out of Court by mutual agreement; the Board agreeing to pay rates as soon as it has declared the sections open for lease or when the Council has agreed to accept dedication of the streets. It was agreed that each side should pay its own costs of the case.

LICENSES.

Licenses to occupy sites on the foreshore were granted to the Victoria Cruising Club, the Waitemata Boating Club (renewal), the Royal Naval Reserve, the St. George's Rowing Club, the Auckland Rowing Club, and the Akarana Yacht Club; whilst sites for slipways were granted to the Naval Board at Calliope Dock and to the Colonial Sugar Refining Co., Ltd., at Chelsea.

Licenses were also granted to the Atlantic Union Oil Co., Ltd., for the erection of a landing off its leasehold property in Freeman's Bay, and to Messrs. W. Casey, Ltd., for a boom site in the same area.

HARBOUR WORKS.

Plans of the following works were approved by the Board and by the Governor-General in Council; breastwork, Mechanics Bay; new vehicular landing, Mechanics Bay; gridiron for fishing and trading launches at Nelson Wharf; and a contract was let for the formation of the 90-ft. road (French Street) giving access to the new vehicular stage.

A contract for the enlargement of and alterations to the Board's Offices in Quay Street was let to Messrs. Adams and Hine, for the sum of £7,400, and the work was well in hand at the close of the financial year.

Requests for a new wharf at Northcote and for alterations at Bayswater and Greenhithe Wharves were declined on the ground that the existing facilities were adequate.

An agreement was come to with the Birkenhead Borough Council for improvements to the foreshore near Birkenhead Wharf, but the poll of ratepayers taken by the Council to permit the borrowing of the necessary funds was defeated, and the scheme had to be dropped.

The question of accommodation for the Waterside Workers' Union received close consideration, and various schemes were discussed. Alterations to the existing building were approved, but no decision in regard to the provision of a new building was arrived at.

A request that the old Devonport Cargo Wharf be not demolished was not entertained, on the grounds that the Board had provided a cargo wharf as part of the new passenger and vehicular wharf, and that the cost of maintenance was too great.

The official opening of the new wharf at Devonport took place on 7th July, 1928. Speeches were made by the acting chairman of the Board (M. H. Wynyard, Esq.), His Worship the Mayor of Devonport (Ernest Aldridge, Esq.), the Hon. E. W. Alison, M.L.C., and Alex. Harris, Esq., M.P.

A dispute arose with the Devonport Borough Council over the interpretation of the agreement with regard to the reclamation of the area required to widen King Edward Parade, Devonport. After long negotiation the Council agreed to pay the Board £2,000 in full settlement of its claim for £3,188 13s. 3d., and a clause validating the agreement was inserted in "The Local Legislation Act, 1928."

HOBSON BAY.

A proposal by the Railway Department for permission to reclaim later on an area of 27 acres between the road and the railway embankments in Hobson Bay; and the recommendation of the Board's Engineer that the Board should ask for the reservation of a strip of about 6 acres, brought forth a storm of protest in the newspapers and in Parliament.

The proposal that the area inside the railway embankment be retained as an artificial lake by the provision of sluice gates was again brought forward, but the difficulties in the way of keeping the water pure were pointed out by the Board's Engineer and nothing further was heard of the matter.

ST. MARY'S BAY BOAT HARBOUR.

The necessity of providing a permanent home for the various aquatic clubs in the Waitemata was emphasised by owners of pleasure craft, and the Harbour Master and Engineer were instructed to report on the matter. Their report, making certain recommendations in regard to the leasing of sites in St. Mary's Bay Boat Harbour, was referred to the Yacht and Motor Boat Association, but had not been dealt with before the close of the financial year.

St. Mary's Bay Boat Harbour was proclaimed a Protected Anchorage with the consent of the Minister of Marine.

Some criticism of the Board by persons professing to represent yacht and launch owners brought forth a reply from the New Zealand Power Boat Association, which wrote expressing its approval of the Board's policy in connection with the provision of facilities for yachtsmen, and its thanks for the consideration and assistance given by the Board and its officials to owners of pleasure craft.

CLAIMS.

A claim was made against the Board by two waterside workers (Messrs. Hoy and Bennett) for compensation for injuries received through being struck by a bale of blankets falling over the edge of one of the chutes in Shed 21, Prince's Wharf, and was heard in the Supreme Court before Mr. Justice Blair and a special jury of twelve. After a trial lasting three days the verdict was against the Board, and a motion for a new trial made by the Board's solicitors, on the ground that the verdict was against the weight of evidence, was not entertained. The damages awarded were £494 to Bennett and £491 to Hoy, with costs amounting to £286.

In another claim, made by the Union Steam Ship Co., of New Zealand, Ltd., for compensation for injuries to a tally clerk (E. Yates) through being struck by a bale whilst standing at the bottom of a chute in Shed 22, Prince's Wharf, the Board declined to admit liability and the case was dropped.

ONEPOTO STREAM, NORTHCOTE.

The request of the Northcote Borough Council and the adjoining landowners that the Board should agree to an embankment and bridge being erected across the mouth of this stream in order to give road access to Northcote, was the subject of considerable correspondence. The scheme was eventually approved and some necessary exchanges of land were agreed to. A proposal from the Borough Council that the Board should agree to the substitution of an embankment for the bridge and the vesting of the tidal lands inside the embankment in the Council was not entertained.

DRAINAGE.

Consideration of schemes for drainage of sewage into the Harbours of Auckland and Manukau again took up a good deal of time of the Board and its officials. The Commission set up by the Minister of Health, comprising the District Engineer, Public Works Department, and the Medical Officer of Health for the district, sat and took evidence from the various Local Authorities, but its findings were not available when the year closed.

RAILWAY SIDINGS TO WHARVES.

Several conferences took place with representatives of the Chamber of Commerce, shipping interests and others in regard to the layout of railway sidings to wharves off the Eastern Reclamation. The objections raised were fully discussed with the officials of the Railway Department, who expressed themselves as entirely in accord with the Board's scheme.

WAITEMATA HARBOUR BRIDGE.

Representations made by the Harbour Bridge Association in regard to the proposed bridge across Waitemata Harbour, and the Association's requests that the Board should approve the site chosen by it and contribute to the cost of survey, received lengthy consideration. The Board finally resolved as follows:—

(1) That the erection of a bridge across the Waitemata Harbour is not a harbour work to which the Board, as such, should be asked to contribute;

(2) That the Board, while not opposed to a bridge across the Waitemata when circumstances warrant such a structure as an economic necessity, must protect the present and future port requirements as its paramount obligation;

(3) That, from the Board's standpoint, the type, height and site of any bridge across the Waitemata should not be settled without the Board's approval or after the decision of a tribunal on which the Board has substantial representation, and after careful investigation and reports by experts;

(4) That the site suggested by the Association will require the careful consideration of the Board; the Board having been advised by its Engineer and Harbour Master that such site is not satisfactory as interfering with the present and future port requirements.

KAURI POINT DOMAIN.

The arrangements made in 1916, when the Board agreed to an exchange of land at Birkenhead whereby the area set aside as a domain was controlled by a Board comprising the Mayors of Auckland and Birkenhead, the chairman of this Board, the chairman of the Waitemata County Council, with the Commissioner of Crown Lands as chairman, was found to be unworkable. The consent of the Board was given to the control of the domain being vested in the Birkenhead Borough Council.

PORT FACILITIES.

A request from the United States Department of Commerce for voluminous information regarding the port, its trade and facilities, to be issued in booklet form, was referred to the Marine Department, which stated that it had no objection to the information being given. Considerable time and labour were spent by the Board's officials in getting the information together and it should prove valuable for future reference.

OIL IN HARBOUR.

"The Oil in Territorial Waters Act" has proved of great value in preventing the discharge of oil and oil refuse into the harbour; but cases still occur where discharge takes place through inadvertence or carelessness. The weakness in the Act is that it is very difficult to sheet home the offence in cases of this kind, especially where two or three oil-burning vessels are in port at one time. Where it has occurred and could be proved, the Board has taken the matter up strongly with the owners of the vessels concerned.

S.S. "FIREFLOAT."

A fire, which started on 1st April, 1928, and lasted for some days, consumed a large benzine store situated on the Board's Freeman's Bay Reclamation, and its contents, the property of Messrs. Winstone, Ltd. The Board's s.s. "Firefloat" was used to assist in extinguishing the fire, and this led to an agreement being come to with the Auckland Fire Board for the use of the vessel in fires on the waterfront. Later, however, the Board decided to lay the "Firefloat" up on account of the expense of running her, and a proposal to instal fire-fighting appliances on the tug "Te Awhina" was under consideration.

GARBAGE REMOVAL.

The contract with Messrs. Parry Bros. for the removal of garbage from vessels having expired, tenders were called on an amended specification, and Messrs. Parry Bros. were again the successful tenderers. The service is being carried on with satisfaction to all concerned.

LOANS.

Loans amounting to £100,000 fell due on 10th January, 1928. To repay this, £50,000 was borrowed from the Auckland Savings Bank, the sum of £38,800 was paid over by the Sinking Fund Commissioners, and £11,200 was found from Revenue Account. The stipulation made by the Local Bodies' Loans Board that the sinking fund on the renewed portion of the loan should be three per cent. to enable the loan to be paid off in 21 years, was agreed to by the Board.

The sum of £100,000 was borrowed for harbour works under authority of "The Auckland Harbour Board Loan and Empowering Act, 1924," and negotiations were opened for borrowing the sum of £223,000 in London to repay loans amounting to £350,000 due on 10th January, 1929; there being £127,000 available from the investment of sinking funds.

It was decided that all future loans, where practicable, should be for a term of 30 years and that a sinking fund of 1½ per cent., which would be sufficient to repay the loan in that term, should be provided. (The Board's policy previously was to issue loans for 20 years with 1 per cent. sinking fund).

RESERVE FUNDS.

Calls were made upon the Board's reserve funds in connection with the Hoy and Bennett case (Machinery Accident Insurance Fund) and the "Hikurangi"-"Havoc" collision (Marine Insurance Fund).

The Accident Insurance Fund had no very serious calls upon it during the year.

The matter of sinking funds for the Board's loans was referred to the Finance Committee for consideration and its recommendations in regard to the provision of sinking funds adequate to fully redeem loans on the due date, were approved.

WHARFAGE CHARGES.

A request from the Northern Steamship Co., Ltd., for a reduction in the wharfage charges on goods carried coastwise within the Province to enable it to compete with the Railway Department was the subject of long and close investigation by the Finance Committee of the Board. The Committee found that the Board was debarred by Section 56 of "The Harbours Act" from giving preference to goods shipped from or destined for any particular district, and its recommendation that no action be taken was approved by the Board.

Requests for reductions on other classes of goods were also declined.

DUES ON GOVERNMENT STEAMERS.

The placing of the Government motor vessel "Mauri Pomare" on the Island Service brought up the vexed question of the liability of Government-owned trading vessels to pay harbour and dock dues. As the vessel was purely and simply engaged in trading, representations were made to the Minister of Marine on the matter, but without success; and the Board eventually agreed, without prejudice, to accept out-of-pocket expenses for docking as provided by Statute. No payment whatever was received on account of port charges, pilotage, or berthage.

LONDON AGENCY.

The Board's London Agent, Mr. C. R. Butters, intimated his acceptance of the position of secretary to Messrs. Wisdom, Mart and Co., Ltd., but offered to continue to act for the Board. The matter was left with the chairman of the Board to interview Mr. Butters on his trip to England. The chairman's report on the matter had not been received prior to the close of the financial year.

ADVERTISING THE PORT.

Exception having been taken by the Controller and Auditor-General to the expenditure by the Board of £600 in advertising the port in the special supplement of "The London Times" issued at the time of the visit of Their Royal Highnesses the Duke and Duchess of York, the Minister of Marine agreed to insert a clause in "The Local Legislation Act, 1928," validating the payment, and this duly became law.

Fear of similar action by the Audit Department prevented the Board from complying with the request of the Auckland Advertising Club to contribute to the cost of its booklet "The Gateway of New Zealand."

ASSOCIATION OF PORT AUTHORITIES.

A request from the Association of Pacific and Far East Ports, with headquarters in San Pedro, California, U.S.A., that the Board should join the Association and be represented at the 1928 Conference, was declined.

No Conference of the Harbours' Association of New Zealand was held in 1928, but the chairman of the Board attended meetings of the Executive of the Association, and several remits were drawn up for consideration at the Conference to be held in 1929.

MANUKAU HARBOUR.

Onehunga Wharf.—An agreement was arrived at with the Railway Department for the maintenance of the railway sidings on this wharf; the Department agreeing to maintain a length equal to the length of the sidings owned by them on the old wharf and the Board maintaining the balance.

Harbour Lights.—At the request of the owners of trading launches and sand barges, the provision of a flashing light on Week's Point, off Puketutu Island, was approved.

Licenses.—Messrs. Bray and Co.'s license for a landing at Onehunga was renewed for seven years, and a license was granted for fourteen years to the Challenge Phosphate Co., to erect a reservoir on the foreshore at Otahuhu in connection with the company's fertiliser works.

Boat Harbour.—A scheme for the utilisation of Geddes' Basin at Onehunga as a boat harbour was placed before representatives of the owners of pleasure craft in the Manukau, but it was found that the cost would be prohibitive.

Waikato-Waiuku Canal.—Several meetings of the Manukau Harbour Committee were held, at which evidence was taken and reports considered regarding the proposal to connect Manukau Harbour with the Waikato River by canal. An inspection of the proposed route was also made in company with the representatives of the Auckland and Onehunga Chambers of Commerce. The Committee had not, however, completed its investigations at the close of the year.

STAFF.

The Traffic Manager's recommendation that the Night Patrol be abolished and that Traffic Night Officers be appointed, who should have full charge of the wharves at night time, was approved.

Two of the Board's officials with lengthy service behind them resigned during the year. Mr. Frank Macfarlane, Engineer at Calliope Dock, with 27 years' service, was given six months' leave on full pay, before retiring on superannuation; and Mr. Thomas Higgins, Chief Waterman, with 44 years' service on the wharves, 23 of which were spent with the Board, was given a year's leave on full pay. Captain R. G. Bell, Day Officer in the Harbour Department, with 19 years' service, retired on the ground of medical unfitness and was placed on superannuation.

Launch of a New Submarine.

On the 19th June, 1929, the "Capitan O'Brien," the first of the three Chilean submarines under construction at the Naval Construction Works of Vickers-Armstrongs, Ltd., at Barrow-in-Furness, was handed over to Admiral Luis Escobar, the Chief of the Chilean Naval Commission in London, in the presence of the Chilean Consul in London and the Chilean and British naval officers and men stationed in Barrow and a large number of the staff and employees of the works.

The proceedings were enlivened by the shipyard band, which played the Chilean National Anthem when Admiral Escobar broke the ensign.

After the ceremony of handing over the vessel was completed, the directors and staff entertained Admiral Escobar and his officers to lunch in the works, when Commander C. W. Craven, the managing director, proposed the toast of the submarine and good luck to the officers and men who sail in her.

The "Capitan O'Brien" was launched on the 2nd October last by Madame Costa-Pellé, the wife of Admiral E. Costa-Pellé, who at that time was Chief of the Chilean Naval Commission in London, but has now returned to his native country. She is of the British "O" Class type, and in addition to her sister ships, the "Capitan Thompson" and "Almirante Simpson," Messrs. Vickers-Armstrongs, Ltd., have also under construction a submarine depot ship for Chile.

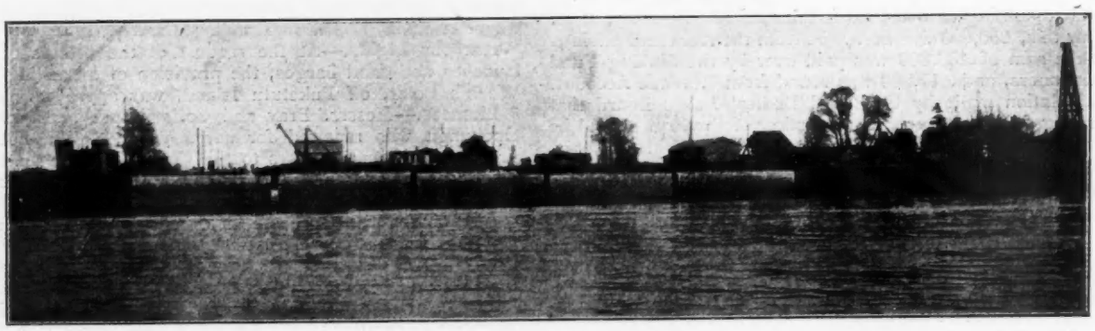
AUTOMATIC WEIGHING MACHINES.

Messrs. Henry Simon, Ltd., of Manchester, have issued a brochure on their automatic weighing machines, which fully describes the various types made by them, and also the problems involved in the design of same. Copies can be had on application to Messrs. Henry Simon, Ltd., as above.

NEW FLOUR MILL FOR NORTH VANCOUVER.

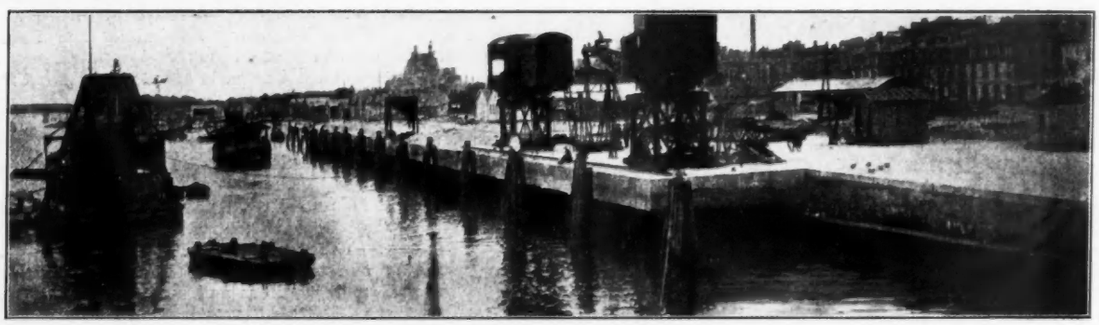
Early this year Mr. W. E. McGaw and associates of Vancouver announced their intention to construct at North Vancouver a flour mill costing $1,000,000, the first large tide-water flour mill in British Columbia. The site is located at the foot of Kennard Avenue on Burrard Inlet, and has a 300-ft. frontage, the Company having an option of an additional frontage of 200-ft. Application has been made to the City authorities for free water at the mill site and reduced assessment on the property. The plant is to consist of a 500,000-bushel elevator, modern flour mill, a wharf equipped for loading grain and flour, and a modern feed manufacturing plant.

The Port of Bordeaux.

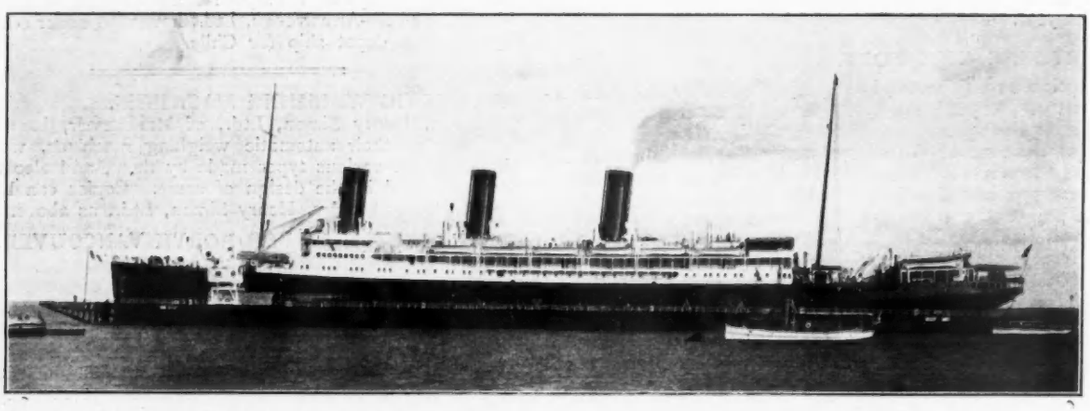


New Bassens Wharves.

Quayside Railway Station. French Line Accommodation.



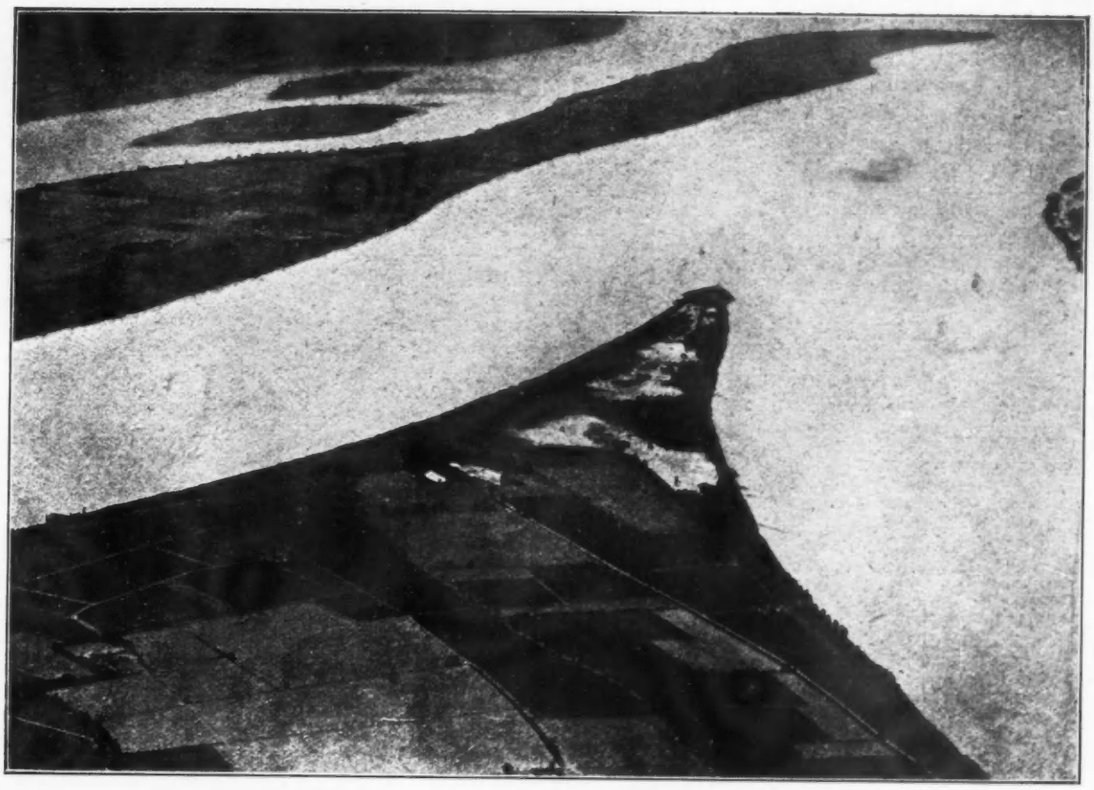
Boniti Quay. Barge Pier further upstream than Stone Bridge.



S.S. "Lutetia," of the Shipping Company "Compagnie Sud-Atlantique," in the 25,000 tons Floating Dock.

Latest Developments at the Port of Bordeaux.

By ROGER VEVER, Ing.E.C.P.



Aerial View of Bec d'Ambes. Left: River Garonne. Right: Dordogne.

THROUGH the courtesy of M. Lévèque, Ingénieur en chef des Ponts et Chaussees, the port manager, we are able to give particulars concerning the latest improvements needed to cope with the ever-increasing traffic of Bordeaux. The development of this port is mostly due to clever management by the Port Authority, which was recently freed from Government control, and bears the name of "Port Autonome." The chairman of the Harbour Board is Mons. Vial, the successor of Mons. Banes.

NEW CRANES.

As a first step towards speeding up cargo traffic all cranes will soon be worked by electricity, and their number will be greatly increased. The 33 hydraulic cranes operating on the left bank wharves are now being replaced by electric ones, built by the firm of Jeumont. Three bridge cranes spanning 330-ft. and two luffing cranes of 15 and 30 tons have been ordered from German firms.

DATA CONCERNING 3 TONS JEUMONT CRANES.

Maximum load 3 metric tons for a 15 metres radius; maximum radius 17 metres (load not to exceed 2.5 tons); minimum radius 6.50 metres. The jib is level luffing and of "Mitchell's" patent. The longest horizontal course of the load is 10.50 metres, and may be covered within eight seconds. The hook is supported by a single wire. Lifting speed 1.20 metres per second. Minimum height of jib pulley above quay level 21.40 metres, corresponding to maximum radius of 17 metres; gantry span 4.50 metres.

The roof of the cab may easily be opened and machinery removed by an adjoining crane for repairing. Appropriate windows enable the driver to see the load wherever it may stand. The cable, 22 millimetres in diameter, is made of six strands of 37 wires each, the steel used withstanding a strain of 160 kgs. per square millimetre. Ball bearings have been widely used throughout the various parts of the crane, including winches and swivel. Slewing is obtained through screw gear and electric motor, a circular rail and steel rollers being supported by the gantry. A screw gear and an electric motor are also used for luffing; magnetic brakes stop the jib at will; while its inclination may be read on a special dial housed in the cab.

Electricity is conveyed to the crane through underground rail and brushes. The current is alternating, three phases, 440 volts, 50 periods. Electric motors used in the crane turn at a speed varying according to the load between 720 and 920 revolutions per minute.

MEASURED POWER OF ELECTRIC MOTORS.

Lifting (open), 50-h.p.; slewing (armoured), 7-h.p.; travelling (armoured), 18.5-h.p.; luffing (armoured), 7-h.p.

An extra motor is used for clutching the lifting motor, while another acts on the lifting winch, both having a braking effect.

The maximum amount of electric power consumed per load of 3 tons lifted from the ship-hold to the shed is 300 hour watts.

Mons. F. LEVEQUE,
Ingenieur en Chef des Ponts et Chaussees and Port Manager.

NEW SHEDS FOR LEFT BANK WHARVES.

The sheds now in course of construction will accommodate both passengers and cargoes; their lengths vary from 108 to 150 metres, having a standard breadth of 30 metres. The shed, entirely made of reinforced concrete, rests on many rows of pillars, each one standing on its own foundation block; the pillars are 6 metres distant from one another. The foundation

blocks which border the shed lay on top of two reinforced concrete piles, and the others on three; these piles, of a square section of 0.35 metres by 0.35 metres, are driven through reclaimed ground till their shoes get jammed into the deep clay strata which are the foundation grounds on this side of the river.

The sheds are closed by walls except for an open apron 6 metres wide, which has been provided on the first storey and where cargo may be handled by the quay-side cranes. The roof is almost flat and covered with special tar compound, sheltered from the sun by a layer of sand and gravel 0.05 metres thick. The many openings on both land and river sides may be shut by iron curtains. Telpher cranes run alongside the shed wall on the land side, handling cargo between the first floor and rail or road cars. Rail tracks run on both river and land side, two being on the 15 metres wide apron, the quay-side gantry crane spanning over that nearest the edge. Cranes and elevators are hired from the Port Authority, who supplies also electricity for both power and light, users being charged according to figures registered on the meters.

SHIP REPAIRING FACILITIES AT PANILLAC-TROMPE-LOUP.

These facilities will include four floating docks of the following tonnages:—One of 25,000 tons already in commission; one of 8,000 tons (now on the stocks at Hamburg); one of 15,000 tons (to be built after the latter is launched); one of 2,500 tons; and two workshops in which most repairs to either hulls or engines may be carried on. One of these, being accommodated on a lighter, may be brought alongside the ships; the other is built on the bank.

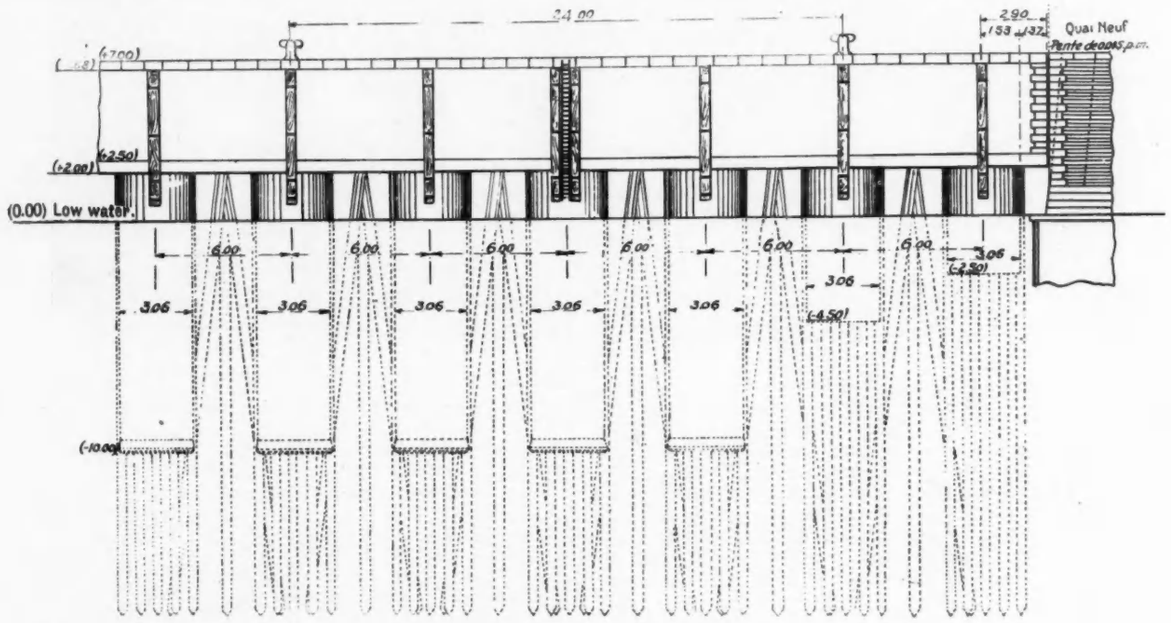
Eight electric capstans (two in the middle and two at each end) of tractive powers ranging between five and fifteen tons, tow the entering liner from the side caissons at a speed of eight metres per minute. Two flexion detectors, one optical, the other hydraulic, are housed in the controlling cab and show any deformation that might be caused by a different water level in the various tanks. Two list indicators warn of tilting positions, whether transversal or longitudinal. Revolving gangways at each end provide easy communication between the two side caissons.

The dock is fitted with a fire engine capable of pumping 60 cubic metres of water per hour. Complete electric and compressed air circuits run throughout the dock. This dock is the largest France possesses, and is sufficient for careening the biggest liners that sail from Bordeaux. The depth of the berth is 16 metres on a mean high tide. Means of extending the lifting power from 25,000 to 30,000 tons are now under consideration.

This dock has accommodated the s.s. "Lutetia," which is 182 metres long, 19.54 metres wide and of an 8 metres draught, belonging to the French shipping company "Compagnie Sud Atlantique," and is one of the two largest vessels having Bordeaux as a home port.

REBUILDING OF "BASSENS" PIERS.

The Bassens piers hurriedly built during the Great War as a temporary accommodation consist of two quays 12.50 metres long, each made of resinous timber, and are now worn out; the work of replacing them by new ones has been begun and will be completed in about two years' time. A different type



Left Bank Quay: Front View of Rebuilt Pier.

25,000 TONS FLOATING DOCK.

This dock was built in the "Vulcan Werk" yards (Hamburg) in fulfilment of the Dawes Plan for German reparation in kind and towed to Bordeaux, where she has been in commission for some time.

DATA CONCERNING THE DOCK.

Length overall 220 metres; length of side caissons 170 metres; inner width: top, 36 metres; bottom, 34 metres. The hull consists of three separate caissons bolted to one another, and any two of these may be used for careening the third one after separation. Longitudinal and cross bulkhead divide the hull into forty watertight compartments, 24 being located in the middle caisson and eight in each outer one. Sea-cocks, worked by both hand or air controls, give admission to water ballast, six turbines being used for emptying the tanks. Sinking takes 30 minutes, and raising a 25,000 metric tons load two hours. The bottom wears only one row of keel blocks, while a 17-stays cradle is attached to the side caissons, the position of the stays being controlled from the bridge. Electricity may be supplied either by the dock's own plant or by land works.

The plant consists of four generating groups of 200 K.V.A., each producing alternating current of three phases, 50 periods, each alternator being driven by a 250-h.p. six-cylinder Diesel engine of the four-stroke type. The alternators were built by the firm "Siemens-Schukort," and turn at a speed of 375 revolutions per minute, the power factor being 0.8 and the efficiency 90 per cent. One gantry crane with luffing and slewing jib lifting 5 tons at a maximum radius of 20 metres, travels on top of each side caisson.

of pier has been chosen for the up-stream and down-stream quays.

UP-STREAM QUAY.

The existing pier, built by the U.S.A. Army Engineering Corps, is made of a great number of wooden piles driven in front of the river bank and jammed into hard ground; it will be replaced by a quay of the type called by French harbour people "Type de Rouen," because of its extensive use in the latter port.

LOADS AND STRAINS FOR WHICH THE QUAY HAS BEEN PLANNED.

Uniform load on reclaimed grounds; 6 metric tons per square metre maximum horizontal pull on the bollards; 50 metric tons load supported by upright piles under quay wall; from 10 to 22 metric tons horizontal strains are shared by the front inclined piles, the tie-rods and the back piles according to the following ratio:—

Front inclined piles, from 1,500 to 2,130 kilogrammes per lineal metre; tie rods, maximum of 9,900 kilogrammes each; back piles, from 3,580 to 10,700 kilogrammes per lineal metre.

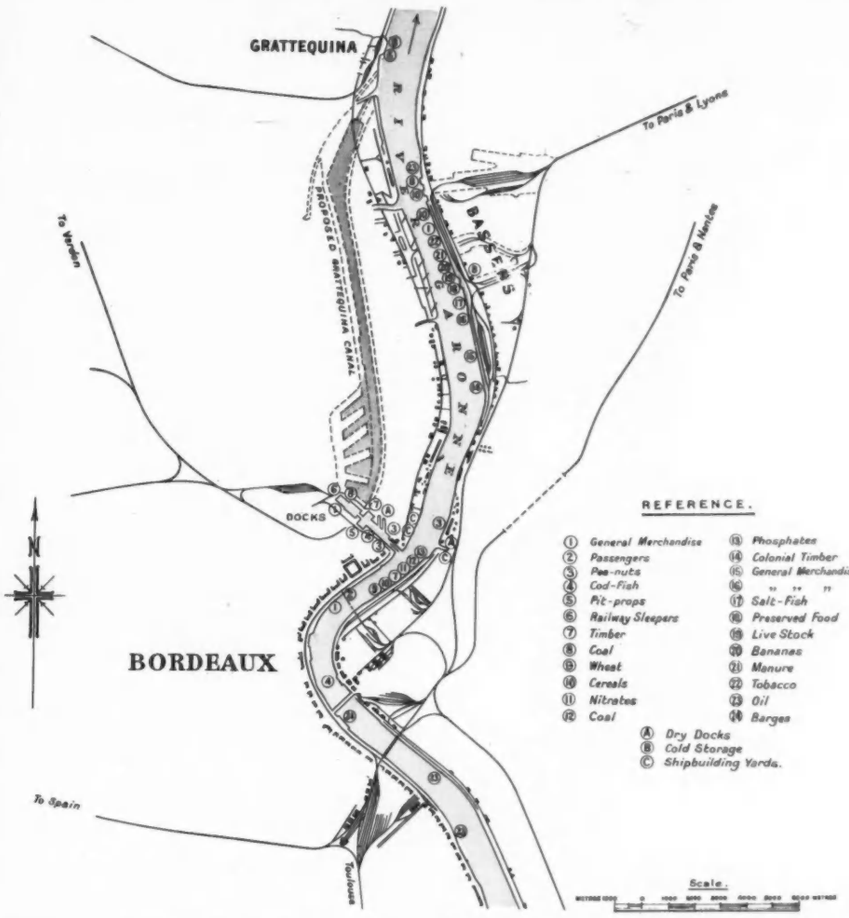
The building expense is about 20,000 francs per lineal metre of quay.

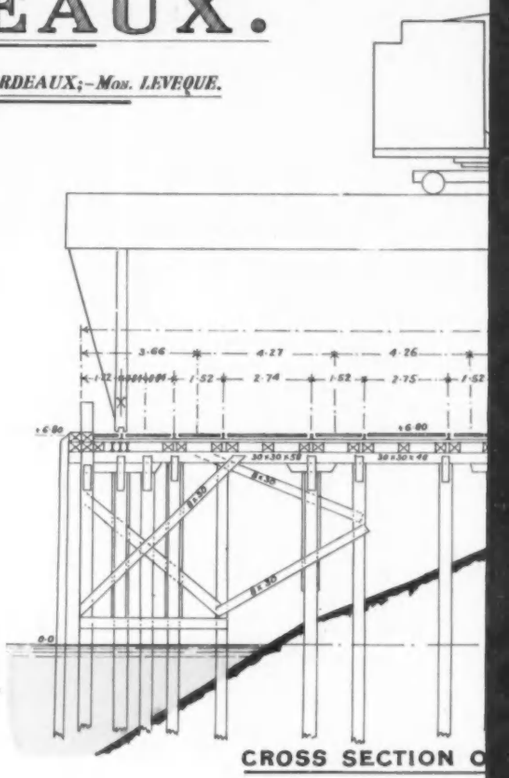
DOWN-STREAM QUAY.

The existing wharf consists of a masonry quay wall at the back of a wooden apron 9 metres wide, supporting cranes, but no railway lines; it will be replaced by a quay of a type already

PORT OF BORDEAUX.

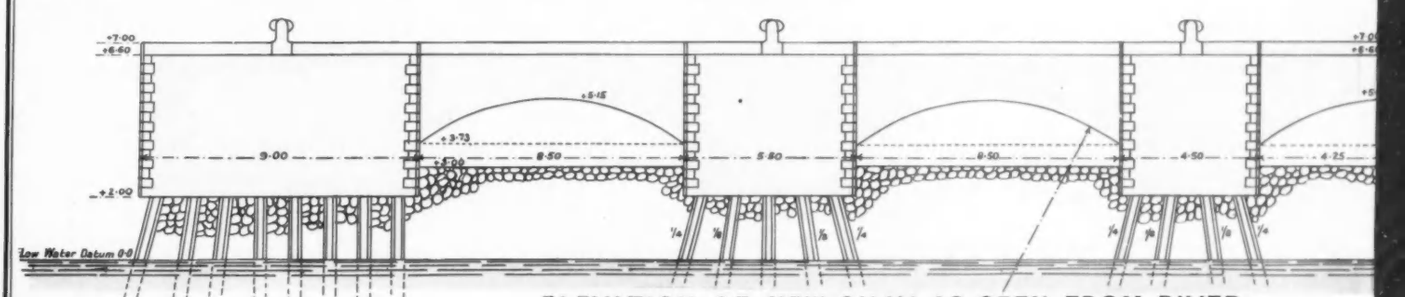
INGÉNIEUR-EN-CHEF DES PONTS ET CHAUSSÉES TO THE PORT OF BORDEAUX;-MON. LEVEQUE.





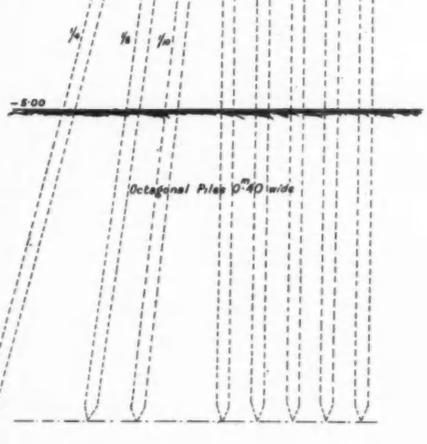
CROSS SECTION O

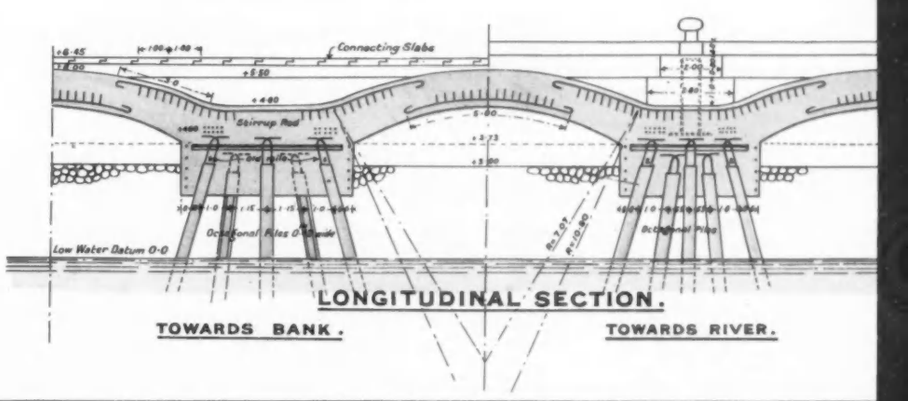
UP STREAM QUAY A



ELEVATION OF NEW QUAY AS SEEN FROM RIVER.

(OAK FENDERS REMOVED)





LONGITUDINAL SECTION.

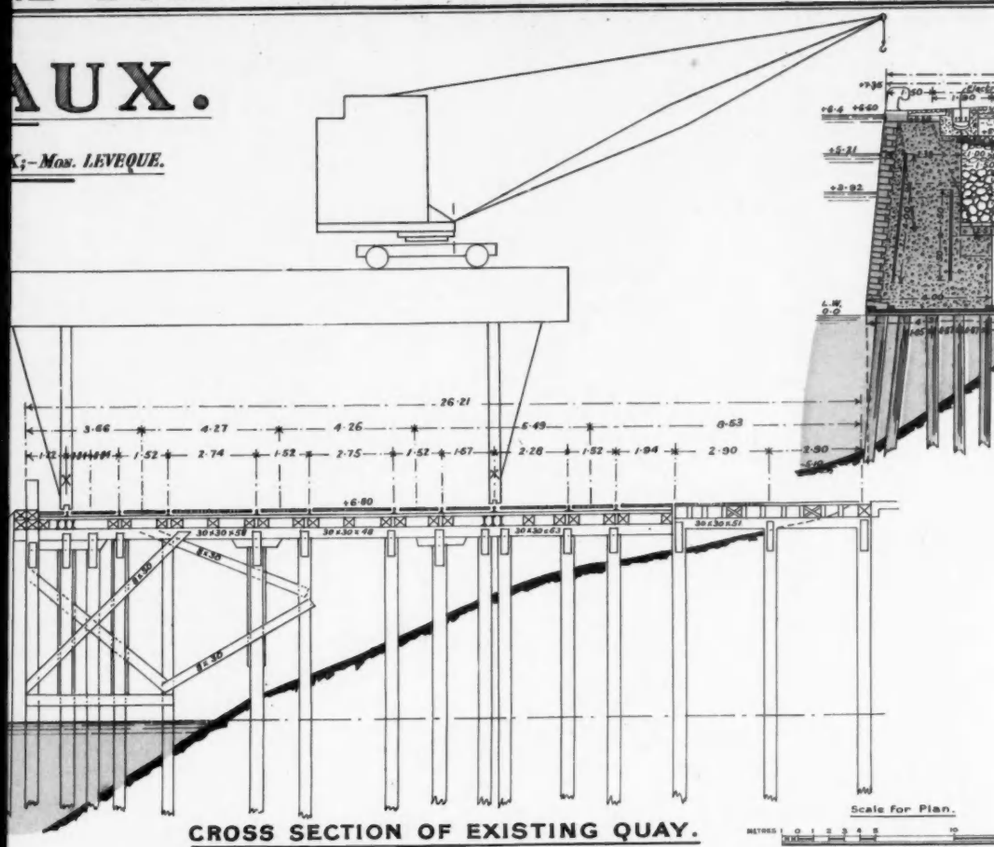
TOWARDS BANK. TOWARDS RIVER.

WARD & FOXLOW. Harcourt St. M

HE DOCK AND HARBOUR AUTHORITY, J

AUX.

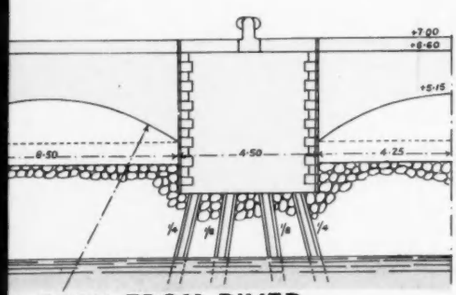
K;—Mos. LEVEQUE.



CROSS SECTION OF EXISTING QUAY.

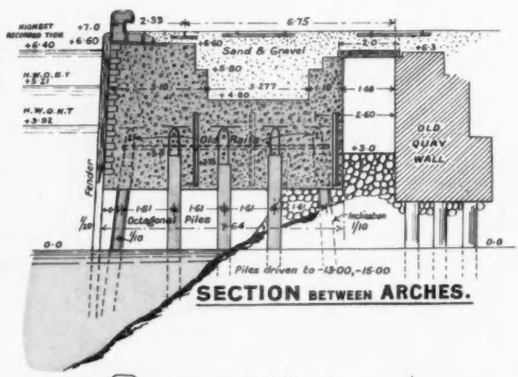
DOWN STREAM QUAY A

UP STREAM QUAY AT BASSENS.

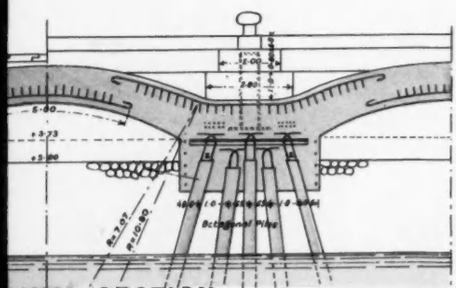


S SEEN FROM RIVER.

VED)

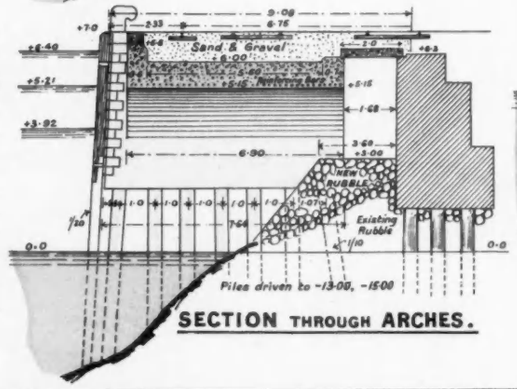


SECTION BETWEEN ARCHES.



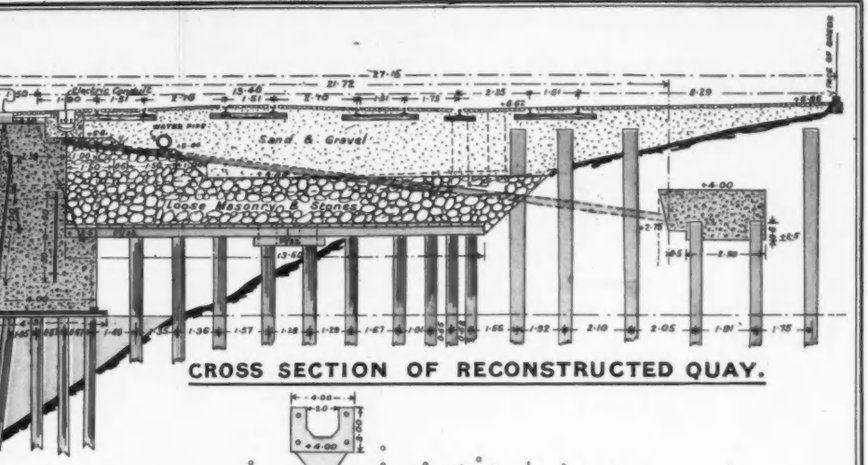
DINAL SECTION.

TOWARDS RIVER.

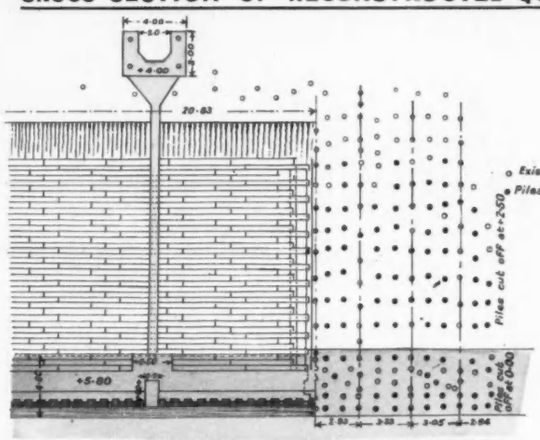


SECTION THROUGH ARCHES.

WARD & FOXLOW. Harcourt St. Marylebone. W.1. 5365.



CROSS SECTION OF RECONSTRUCTED QUAY.



PLAN AT +5·80
(FILLING REMOVED)

PLAN OF PILES.

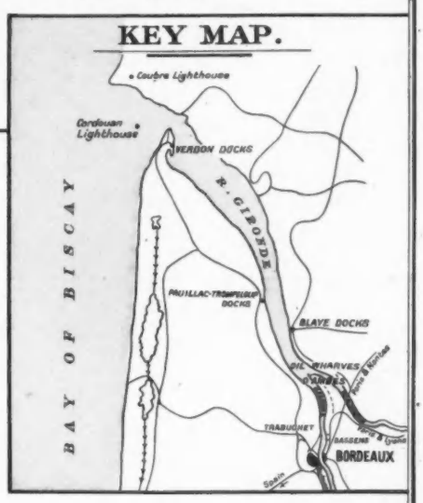
or Plan.

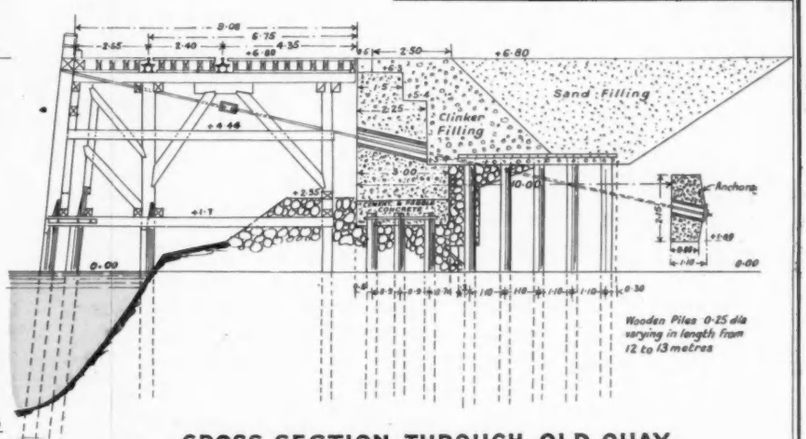
or Sections.

AY AT BASSENS.

Scale For Sections.

KEY MAP.



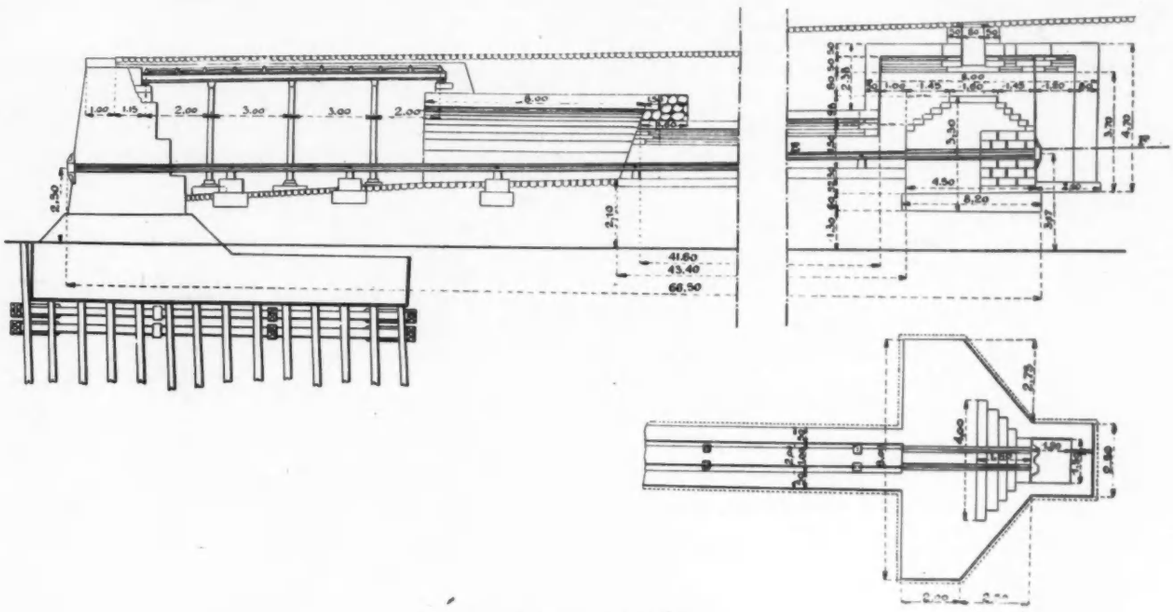


CROSS SECTION THROUGH OLD QUAY.

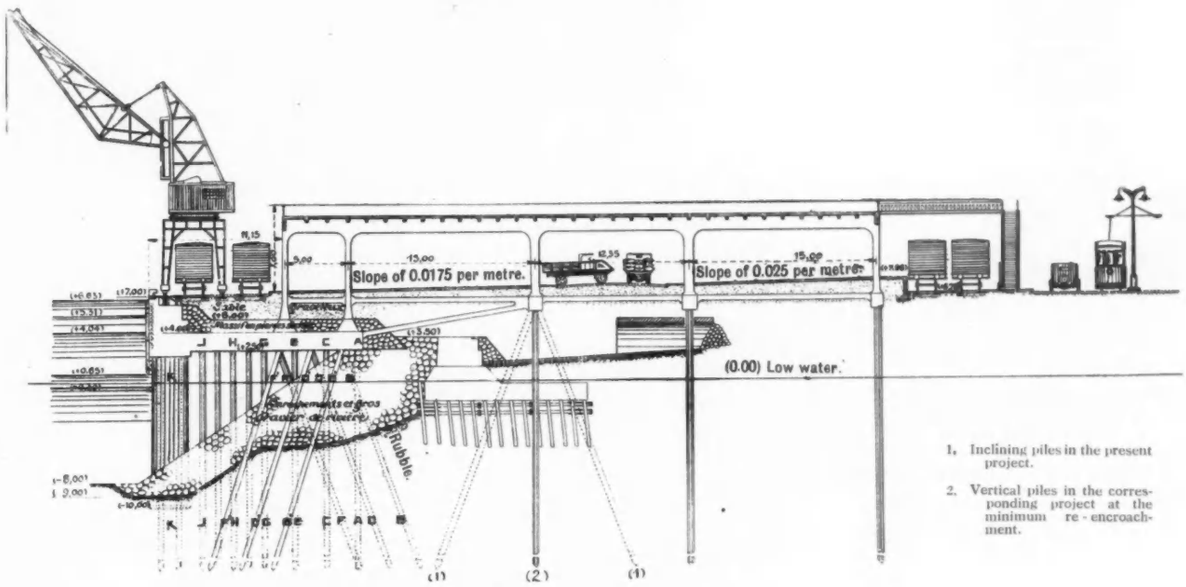
ES.

ES.

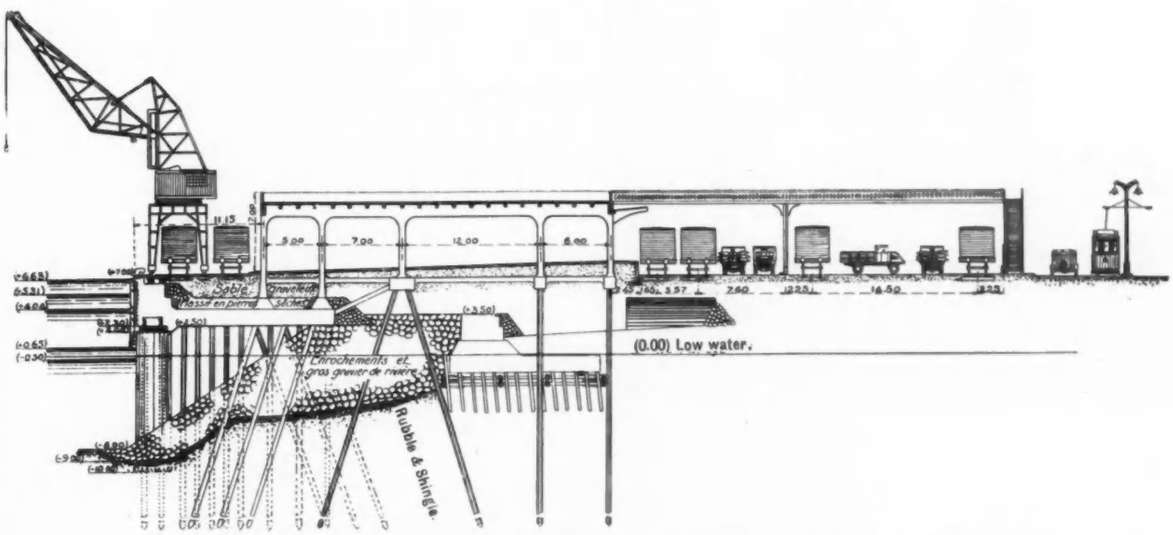
The Port of Bordeaux.



Consolidation of Old Quay.


Slope of 0.0175 per metre.
Slope of 0.025 per metre.
(0.00) Low water.
Rubble.
1. Inclining piles in the present project.
2. Vertical piles in the corresponding project at the minimum re-encroachment.

Left Bank Wharves.



Left Bank Quay and Transit Shed. (Note how the Concrete Shed acts as Anchorage for the Quay).

used in the "Queyries" Docks, Bordeaux. The quay rests on vaults linking independent foundation pillars built in front of the old quay wall, which is strong enough to be used in the new scheme. Larger pillars acting as buttresses are provided at each corner of the quay.

The wharf has been designed to stand a uniform load of 2,500 kilogrammes per square metre, plus an extra load due to bridge cranes spanning 75 metres and used for heavy loads. The building expense is about 20,000 francs per lineal metre of quay.

NEW LEFT BANK QUAYS.

In this part of the river the muddy bottom extends to depths varying from 14 to 21 metres below low water. This rendered very difficult the building of deep-water wharves in front of the former quay wall, which, moreover, presented a doubtful stability; an attempt to hold it by the rods did not prove satisfactory, the masonry having slipped 0.80 metres towards the river and sunk 0.30 metres within 15 years.

These movements showed that it would not be possible to dredge deep berths in front of the old quay wall, and the scheme was abandoned.

The new quay was therefore designed; it is of a type never used before at French ports, and suits admirably both technical and economical requirements; the foundations are laid without making use of expensive compressed air caissons, and wooden piles, delivered by Germany under the Dawes Plan, are the chief items. Owing to the depth of the berth (—8 metres) it has been found necessary to set outer wooden piles by groups of four and to jamb them into concrete from the depth of (—10 metres); it was first intended to stop the concrete block at (+2), but it was later feared that piles would yield to excessive pressure.

Inclined piles have been widely used, and resist to compression or extension strains, and the whole concrete shed acts as anchorage for the quay.

These concrete pillars enclosing the groups of four piles are 6 metres distant from one another, and are made by filling with concrete a concrete cylinder 3.06 metres in diameter with 0.13 metres thick walls. The concrete slab which connects the quay to the shed is 1.50 metres thick and 14 metres broad; it is supported by octagonal concrete piles 0.40 metres wide, driven either vertically or with an inclination of 1 : 3 toward either land or river.

The concrete pillars are connected by iron beams which are used as gangways during the construction, and become later part of the reinforced concrete bow.

S.S. "Lutetia" entering the 25,000 tons Floating Dock.

Berths of the new quay are to be 150 metres long, and will each be fitted with a shed 100 metres long and 48 metres wide, the total covered area being 3,600 square metres, and the corresponding volume 20,000 cubic metres, about twice the hold capacity of the largest cargo vessels calling at Bordeaux.

The top of the shed will be open to the public. Strains due to the mooring of vessels have been supposed equivalent to that caused by an horizontal force of 75 metric tons per bollard. The bollards are 24 metres from each other. Load on the apron, 3,500 kilogrammes per square metre; load on ground floor of shed, 4,000 kilogrammes per square metre; load on first floor of shed, 2,500 kilogrammes per square metre.

M. ALFRED DE VIAL,
Chairman of the Bordeaux Harbour Board.

TABLE SHOWING STRAINS (IN TONS) OF PILES.

Number of piles	Horizontal strain	Vertical strain	Strain parallel to inclined piles	Strain per pile	Position of pile
A (two piles)	34.7	100.2	—	50.1	—
B (one pile)	53.0	36.9	33.3	33.3	Inclined
B1 (one pile)	36.9	59.3	68.0	68.0	Inclined
C (two piles)	7.0	107.0	—	53.5	—
D (one pile)	— 25.9	33.5	40.0	40.0	Inclined
D1 (one pile)	39.1	65.9	74.9	74.9	Inclined
E (two piles)	0.8	114.5	—	57.3	—
F (one pile)	— 37.6	36.7	50.4	50.4	Inclined
F1 (one pile)	49.2	69.4	65.8	65.8	Inclined
G (two piles)	—	120.8	—	60.4	—
H (two piles)	—	127.7	—	63.9	—
J (two piles)	—	134.4	—	67.2	—
K (four piles)	—	281.5	—	70.4	—

The second column of this table shows that a very important part of the horizontal strain is supported by the inclined piles.

The building of these new quays will cost 70,000,000 francs. The price per lineal metre being 75,000 francs, including 12,000 for sheds.

COMPARED STABILITY OF THREE TYPES OF QUAY.

	LOW TIDE			HIGH TIDE		
	Adopted scheme	Rouen type	Pirmil type	Adopted scheme	Rouen type	Pirmil type
	Tons	Tons	Tons	Tons	Tons	Tons
Weight	597.2	345.5	382	400.1	233.7	235
Height of the centre of gravity above low water	Metres +2.28	Metres +2.75	Metres 4.75	Metres 1.95	Metres 2.75	Metres 3.80
Moment from horizontal plan, 9 metres below low water ... (tons x metres)	6740	4059	5261	4396	2792	3015

This table shows the superiority of the type adopted for the left bank wharves over the others from the stability point of view.

(To be continued).

Notes from the North.

A POINT FOR THE DOCK BOARD TO CONSIDER.

That the Mersey Docks and Harbour Board when framing regulations governing the usage of the floating roadway at the Liverpool Pier Head did not contemplate eight-wheeled vehicles was the remark made by the Recorder, Mr. E. G. Hemmerde, at the Liverpool Quarter Sessions on May 23rd, in giving a reserved judgment in a case held over from April 5th, when John Cartwright, motor haulage contractor, of Luther Street, Everton, Liverpool, appealed against his conviction at Liverpool and £5 fine for driving a motor lorry in excess of the stipulated weight along the floating roadway at the Pierhead. The Mersey Docks and Harbour Board regulations stipulated that there should not be a greater weight than nine tons upon each axle of a vehicle using the floating roadway, and then qualified it by saying that no vehicle of greater weight than mentioned in the regulations shall be brought on the floating roadway, notwithstanding the fact that each axle weight was less than nine tons. The biggest weight allowed by the regulation was 15 tons for a six-wheeled vehicle. Appellant's case was that the motor lorry in question was an eight-wheeled vehicle, which was specially designed so that there would be an even distribution of weight. His contention was that the regulation stipulating that nine tons per axle was the only one under which an eight-wheeled vehicle could be brought, and as the lorry with load only weighed 29 tons on the day in question it was within the limit. The further regulations only dealt with four or six-wheeled vehicles. Mr. Justin Lynskey (for appellant) suggested that his client was within the law when they drove an eight-wheeled vehicle with four axles weighing 29 tons on the floating roadway.

On May 23rd the Recorder declined to grant the appeal. The Dock Board, he said, would be well advised to embody the point raised in a new regulation. He said: " If Cartwright had been taking a reasonable load—say, up to 20 tons—he might have quashed the conviction. A load of 29 tons, however, was out of harmony with the regulations made for public safety."

FLEETWOOD SEA WALL.

The final stages have been reached in the construction of the new sea wall at Fleetwood. This varies in width from 8-ft. 3-in. at the base to 3-ft. 6-in. at the top and of a maximum height of 19-ft. from the foundations to the top of the coping. The wall is specially designed to withstand a 38½-ft. tide—that is, one 6-ft. higher than the tide which submerged Fleetwood in October, 1927. The estimated cost of the barrier, in the construction of which 13,000 tons of cement have been used, is £55,000. Due to the considerable erosion of the coast and the sea " scour " which threatened to undermine the foundations of the wall, it was necessary to build a concrete " apron " at the " toe " of the sea wall for a distance of about 400 yards. Further protection has been afforded by the construction of eight new timber groynes which run out seawards to a distance of 350 yards. These are proving of great assistance in stabilising the shingle on the foreshore which serves as a natural bulwark against the sea's attacks.

A BIT OF HISTORY.

It is just sixty years ago that the first sod of Fleetwood dock was cut by Mr. H. S. Styan, of London, the surviving trustee of the estate under the will of the late Sir P. H. Fleetwood who had died three years before. For some reason which may fairly be conjectured, says one historian, to have been an incompleted list of shareholders, the Fleetwood Dock Company determined to suspend all operations barely six months after they had begun, and the work was never resumed under the same proprietorship. Two years later the Lancashire and Yorkshire Railway Company obtained an Act of Parliament to carry out on a larger scale the undertaking their predecessors had abandoned almost in its birth, and the dock was completed in 1877 at a cost of over £250,000.

TONNAGE RATES ON BULK CARGOES.

The Mersey Docks and Harbour Board have directed that vessels arriving with cargoes consisting exclusively of iron ore, manganese ore, and manganiferous iron ore, or any of those articles, and discharging the whole of such cargoes in any of the Board's docks at Birkenhead and complying in all other respects with the Board's differential rates arrangement, No. 7 on pages 6 and 7 of the schedule of rates and dues on ships and goods, shall be chargeable with 50 per cent. of the full dock tonnage rates, in lieu of 75 per cent. of such rates.

£37,000 FOR NEW EMBANKMENT.

The Minister of Health has given formal sanction to the borrowing by the Liverpool Corporation of £37,000 for the construction of the return embankments at Otterspool Estate.

RECONSTRUCTION OF EGREMONT FERRY.

On June 2nd Egremont Ferry was used for the last time prior to closing down for re-construction of the landing stage and other essential repairs. The pier had got into a deplorable state, and undoubtedly the authorities were risking a good deal in keeping it open so long. It is estimated that the necessary work will occupy about six weeks, but probably this is a sanguine expectation which will not be justified by the event. The ruins of the old Egremont stage have been towed away and placed on the beach at New Ferry to be broken up. The crane Mammoth raised the connecting bridge, a 60-ton lift, and lowered it on the stage. A few days later the new stage, bridge and pontoons, which were lying at Birkenhead, were moored into the vacant position.

Wallasey Corporation has accepted the tender of Messrs. Robert Smith and Sons for the purchase of the old portions of the Egremont landing stage for the sum of £300. The Ferries Committee has had under consideration the joint report of Sir John Wolfe Barry and Partners, the Borough Surveyor, and the Ferries Manager, on the Seacombe Ferry improvement scheme, and resolved that the report be further considered at a special meeting held on the 26th June.

SHIPOWNERS PLEAD FOR CONSIDERATION.

Representatives of the Manchester Ship Canal Company, the Manchester Chamber of Commerce, and numerous Manchester shippers and merchants, accepted the invitation of the directors of the Ellerman, Hall and City Lines to luncheon on June 7th on the s.s. City of Hong-Kong at Manchester Docks.

The chairman, Mr. F. T. L. Prinsep referred to the increase in the amount of money which shipowners had to expend in ports. He did not refer only to the dock dues, but to the cost of handling. Ports which were not prepared to give facilities to enable shipowners to make a direct call were going out of business. Referring to the far-seeing policy of the Manchester Corporation in giving aid to the making of the Ship Canal, and to the courageous, energetic and far-seeing management of the concern, the chairman said that what shipowners pleaded for at the present time was consideration. They were passing through very bad times, and they, in common with many great businesses in this city, were putting large sums of money into the business, but they looked to the future with confidence.

Capt. W. C. Bacon, chairman of the Manchester Ship Canal Company, said the coming of such a ship as the City of Hong-Kong from Bombay and Karachi fulfilled the idea the Canal Company had had in view in regard to the direct import of raw material such as cotton, to Manchester, thereby saving costs and helping the trade of Lancashire and at the same time of giving the opportunity of sending out direct the goods she manufactured.

Mr. F. H. Southern, of the Hall and Ellerman Lines and associated companies, said they claimed to be one of the pioneer shipping lines to make use of the Manchester port, sending their first ship about 1895. Since then they had been in close contact with the directors of the Ship Canal Company and for some time it had been their policy to have a ship there as often as possible. An organisation like theirs was not hide-bound in regard to ports. If they saw trade move, and that it could be developed, they were out to prospect it, and, with the support of merchants and shippers, did as much as they could do to bring trade.

TRANSPORT BRIDGE SCHEME POSTPONED.

Fleetwood Council has had under consideration a scheme for a transporter bridge from Fleetwood to Knott End to supersede the ferry service. After a prolonged discussion in committee, the Council decided to postpone *sine die*. The decision was arrived at mainly owing to cost, as the transporter bridge to span the river near the mouth would have to be 1,400-ft. wide and a bridge of this dimension would require an outlay of £200,000. Further, enormous expense would be entailed in making suitable approaches at both sides of the river. For many months there has been considerable agitation locally for a transporter bridge similar to that spanning the River Tees at Middlesbrough, but this bridge has a span of only 574-ft., and cost nearly £100,000 in pre-war days. Consequently the scheme is, to all intents and purposes, abandoned by the Council, but there is talk of forming a private company to undertake the construction of the bridge if the Council will dispose of its ferry rights. The present ferry steamer service is run by the Council and the revenue from it is about £6,500 a year. At low tides the service is often interrupted, and is suspended in rough weather.

MERSEY FERRY STEAMERS.

Mr. John Cashmore, of Great Bridge, Tipton, has purchased from the Wallasey Corporation the ferry luggage steamer " Seacombe " for the sum of £1,825, this being the highest tender received. The " Seacombe " was built in 1901 at a cost of £16,885 and was replaced early this year by the " Perch Rock," a larger boat costing £42,260.

CHESTER BASIN TO BE FILLED IN.

The Chester basin behind the River Mersey wall at Liverpool is to be filled up to the street level and laid out as an open space in accordance with an agreement reached between the Mersey Docks and Harbour Board and the Liverpool Corporation. This matter has been under consideration of the Health Committee of the Corporation, as this authority will pay for the building of the wall across the opening of the basin.

MANX PIER EXTENSION.

In the Manx Tynwald on June 6th, the Receiver-General proposed the adoption of a scheme for extending the Red Pier by dredging an area 800-ft. by 37-ft. immediately to the east of the present Red Pierhead, so as to give a depth of 15-ft. l.w.o.s.t., building in the centre of this deepened area a solid stone extension of the pier 400-ft. long and 70-ft. wide, and constructing an openwork viaduct 50-ft. wide between the extended part of the Red Pier and the Victoria Pier, so as to provide easy access for foot passengers and vehicles to the extension. The cost is to be £262,000, and a vote is to be taken of £70,000 to finance the work for the coming year.

FLEETWOOD GRAVEL.

Of late years, gravel from Fleetwood's foreshore and harbour has come into fame as being some of the finest procurable for concrete manufacture, where exceptional strength is desired. Huge quantities from the beach opposite Laidleys Walk have been sold to the Fylde Water Board, the Blackpool Corporation and others, sales amounting to nearly 30,000 tons having been recorded in a single year. Still greater is the demand that is now being made for gravel obtained from the river immediately behind the grain elevator by the L.M.S. Railway Company's harbour dredgers. Tests made by Messrs. Earle, the famous cement manufacturers, have yielded results superior, it is stated, to anything previously obtained. Big shipments are being made to Messrs. Lever Bros. for dock construction purposes at Port Sunlight. Inquiries have been received for 5,000 tons for promenade works at Morecambe. Several large inland authorities, it is understood, are also in treaty for supplies and, indeed, there would be little difficulty in booking orders for a quarter-million tons of river-dredged Fleetwood gravel if the L.M.S. authorities were so disposed.

MERSEY LIGHTHOUSE FOR SALE.

Leasowe Lighthouse, Moreton, is offered for sale by the owners, the Mersey Docks and Harbour Board, who have placed the structure in the property market. It is described as containing eight rooms, with outbuildings, half an acre of land, with main water supply, and as being suitable for a private residence or a catering business. It is one of the oldest lighthouses in England. It bears the date 1763, but is believed to be much older. Its light finally went out in July, 1908, when the Mersey Docks and Harbour Board adopted a system of flash-light buoys. It stands between Hilbre Island and Rock Point, and at one time was in charge of a woman lighthouse keeper, a Mrs. Williams, who carried on during an illness of her husband which ended fatally, and was later appointed officially by the Dock Board and kept in charge until 1908. It has always been generally accepted, although it has never been actually verified, that the lighthouse was raised upon a foundation of cotton bales which came ashore from a wreck. Since 1908, when the Mersey Docks and Harbour Board decreed that a system of flash-light buoys should be adopted, the necessity for the stationary light on shore disappeared. The lighthouse has been a private residence for some time, and one could get tea there. There is no garage, but there is that half acre of land for anyone who is attracted. The rates are something like 12s. in the pound.

According to Sulley, in his book published by Messrs. B. Haram and Co., 1889, the first two lighthouses built in England were built at Leasowe in 1763, " of which the upper one still remains in use," and is the only one existing under the powers of an Act of Parliament passed in 1761. He adds that Bidston lighthouse was built in 1771. H. E. Young, writing in 1909, says the site on which the lighthouse stands and which replaced an older one, was purchased by the Liverpool Corporation from William Hough, the price paid being £42 for the twenty square yards.

CLARENCE DOCK POWER STATION.

Liverpool City Council has accepted the following recommendations of the Clarence Dock Power Station (Special):—(1) The Tender of The Metropolitan Vickers Electrical Co., Ltd., Trafford Park, Manchester, for the supply and erection at the Clarence Dock Power Station of one 50,000 k.w. maximum continuous rating Turbo Alternator, with accessories, for the sum of £193,370, be accepted; (2) the Tender of Sir William Arrol and Company, Ltd., Crane Works, Parkhead, Glasgow, for the supply and erection at the Clarence Dock Power Station, of an overhead travelling Crane of 110 tons carrying capacity, for the sum of £4,003, be accepted.

A start has been made on preparing the site for the new power station. The dock is dry and for several weeks now gangs of workmen have been employed on clearing the quays, etc., of unwanted material, fixtures, etc. Steps are now being taken to prepare the foundations for the new power station.

Considerable progress has been made in the work of deepening Princes Dock, which will be used by the steam and motor ships of the Ulster Line. A new dock shed is being erected on the east side of the dock.

MERSEY TUNNEL PROGRESS.

Reporting on the progress of the Mersey Tunnel work, the engineers (Mr. J. Brodie and Mr. Basil Mott) stated at the June meeting of the Committee that on Contract No. 2, which relates to the full-size tunnel under the river, 41.07 per cent. of the excavation and 37.0 per cent. of the cast-iron lining have been completed. Work is proceeding at ten working faces and about 700 men are employed. On Contract No. 3 (the full-size tunnel on the Birkenhead side) 5 per cent. of the excavation has been done and about 150 men are employed. Shafts at Sydney Street and Taylor Street have been sunk to full depth and a third shaft is being sunk at Hamilton Street. Progress on No. 4 Contract (the full-size tunnel on the Liverpool side) is represented by one per cent. of excavation, about seventy men being employed.

NEW WORKS FOR PRESTON DOCKS.

New works have been established on the Preston Dock estate by the Anglo-Cuban Asphalt and Bitumen Limited, who, on June 12th, inaugurated a plant of machinery capable of an output of about 100 tons per day. The natural asphalt imported from Cuba contains a very high percentage of bitumen. It is powdered by a powerful pulverising plant and then used with tar as a material for road surfaces, 15 per cent. of the powder being automatically mixed with the tar inside the machine used for road spraying. About a hundred surveyors, contractors, and public men interested in road making were present at the opening ceremony, which was performed by the Cuban Minister, Capt. W. M. B. Rees is the general manager of the works.

NEW RIVER WORKS IN THE MERSEY.

Mersey Docks and Harbour Board proposes, with the consent of the Mersey Conservancy Commissioners, to construct a training bank of stone on the eastern side of the Crosby and Formby Channels of the Mersey. The bank will commence at a point 975 yards, measured in a south-westerly direction, from the north outer measured mile mark on Great Crosby foreshore and terminate at a point 2,460 yards, measured in a northerly direction, from the beach mark on Little Crosby foreshore known as the Crosby beach mark. From the point at which the work commences to a point situate 800 yards or thereabouts, measured in a north-westerly direction, from the Crosby beach mark the work will have its highest part at or about a level of 10-ft. above Liverpool Bay datum. Thence to the point at which the work terminates the level of the crest is to be raised generally to suit the configuration of the foreshore to a maximum height of 30-ft. above Liverpool Bay datum. The object of the work is the better direction and control of the ebb and flow of the tidal and other waters of the Mersey and its estuary, " thereby to deepen, widen, and straighten the sea channels for the purpose of improving, better maintaining and preserving the navigation of the port." It is likely that the work will commence in the early part of this month (July) and will take about two years to complete. The idea of the training bank was originally suggested by a conference of engineers for the preservation and improvement of the fairways of the Mersey in 1912, when the extension of the revetment and the construction of the Burbo and Formby training banks were proposed. The revetment was completed some years ago and the Burbo training bank, which has been under construction since 1923, will be finished this month (July). Formby training bank will be set back slightly eastward to conform to the channel. The Burbo training bank is about three and a half miles long; the Formby training bank will be about half that length and, in places, some 5-ft. higher than the revetment or the Burbo training bank. Many thousands of tons of limestone from North Wales quarries will go to the construction of the training bank. The stone will be dumped into the river from Dock Board hoppers and the chemical action of the water and the animal life it contains gradually knit the blocks of material together. The training bank will be in pyramid form, ranging from 10-ft. to more than 30-ft. high. Beginning at a point opposite Altcar it will extend towards Liverpool, parallel with the Crosby shore, and end near C8 bell beacon in the Crosby channel off Blundellsands—about a mile and a half out from the shore. Ten hoppers will be more or less continuously engaged on the work.

SULTAN SEES MANCHESTER DOCKS.

The Sultan of Zanzibar visited and inspected the Manchester Docks on June 13th. At the No. 1 Pomona Dock, Manchester Ship Canal, the Sultan was received by the chairman of the Ship Canal Company (Mr. W. C. Bacon) and other directors, and with the rest of the party sailed on the Ship Canal.

MANCHESTER SHIP CANAL TRAFFIC.

According to the monthly traffic returns of the Manchester Ship Canal Company, issued on June 15th, there was a decrease during the month of May, when the revenue amounted to £116,821, compared with the sum of £118,851 for May 1928, representing a decrease of £2,030. On the figures for the first five months of the year, however, the net increase is £5,864 over the corresponding period of last year. The respective figures are £571,562 and £565,698.

FERRIAGE BASED ON H.P.

Revised charges for the ferrying of motor traffic across the River Mersey between Liverpool and Seacombe have just been introduced. At present the tolls are charged according to the length of the vehicles, but by the new system the tolls for the cars may be judged by the licence which indicates the horse power. There is a graduated scale according to the horse power of the cars ranging from 1s. to 2s. 6d. The schedule which existed was based on the following rates:—A car not exceeding 10-ft., 1s.; up to 13-ft., 1s. 4d.; up to 15-ft., 2s.; over 15-ft., 2s. 6d. The new schedule should eliminate the necessity of measuring each vehicle and should expedite the passage of ferry-boat traffic.

The new charges are:—Car not exceeding 7 h.p., 1s.; not exceeding 12 h.p., 1s. 4d.; not exceeding 16 h.p., 1s. 8d.; not exceeding 21 h.p., 2s.; over 21 h.p., 2s. 6d. In cases where the horse power of a car is a fractional figure, the charge will be:—Over .2 on the next figure, and .2 and under on the lower figure.

PORT PROPAGANDA WITH FILMS.

At a meeting of the Mersey Docks and Harbour Board on June 13th, the Trade Committee recommended a grant to the Liverpool Organisation towards the cost of making a commercial film of Liverpool. The suggestion had been under the consideration of the Dock Board, the Corporation, and the Liverpool Organisation to further the propaganda work in connection with the port. By arrangement with one of the leading film companies, a film is to be made of Liverpool showing the various phases of shipping and industrial activities. It will be exhibited not only in England but also in the colonies and in foreign countries.

REDUCED HARBOUR DUES.

In view of the increasing competition by road and rail, the Caernarvon Harbour Trust has decided to reduce the dues for merchandise. The Chairman (Sir Richard Williams-Bulkeley, Bt.) states that the Caernarvon port rates, generally speaking, compare favourably with those of other ports, but those to which the reductions applied were, perhaps, slightly higher.

NEW BRIGHTON PIER RECONSTRUCTION.

The work of reconditioning the New Brighton Pier on the River Mersey is being speeded up. A large quantity of timber required for re-decking, arrived from Australia on June 10th, since when joiners have been working at high pressure with the object of having the Pier open on August 1st. The difficulty in getting delivery of the required timber has delayed the work considerably. This was not the fault of the Wallasey Corporation. It was decided to use yarri for re-decking purposes, mainly because of its durability and comparative cheapness as against the quantities of deal and teak, the former being too cheap and the latter far too expensive. The timber now being used can only be secured from Australia. The recent strike in Queensland delayed the exportation of the timber, with the result the work on the Pier was held up. The number of yarri planks in this country is very few, whilst yarri blocks—used for roadwork, but of no use for piers—could be obtained in large quantities.

Belfast Imports and Exports.

A statement of goods imported into and exported from the port of Belfast during the three months ended 31st March last (together with comparisons with the corresponding quarter of 1928), has just been issued by the Belfast Harbour Commissioners. It is a well arranged booklet of 21 pages, and contains much that is of interest as affording sidelights on the state of trade in the Province of Ulster, Belfast, of course, being the principal port of the Province.

Examining first the returns affecting raw material of the shipbuilding and engineering industries, it appears that during the first quarter of this year 16,760 tons of iron and steel plate and 14,707 tons of wrought and bar were imported, the corresponding figures for last year being 13,563 and 11,038 tons, increases of 3,197 and 3,669 tons respectively. Of castings 3,040 tons were imported, as against 4,805 tons; while 1,100 tons of rivets were brought over compared with 215 tons a year ago.

Exports of linen show an increase of 96 tons—from 8,600 to 8,696 tons, the imports being given as 563 tons as against 611. Linen yarn imports declined from 1,452 to 1,111 tons, while exports remained stationary at 1,164 tons compared with 1,163 a year ago. Flax imports show a big decrease—from 8,953 to 4,350 tons—the exports appearing as 386 tons as against 482. Flax seed imports also declined heavily—from 1,705 to 771 tons—while the exports were 26 tons as against 140. Exports of new ropes rose from 469 to 520 tons, the imports being 91 tons compared with 149. Cordage exports at 1,573 tons show an increase of 276 tons and those of twine rose from 126 to 160 tons.

Coming to the agricultural industry large increases are reported in the exports of cattle, sheep and lambs and pigs. During the quarter 18,098 cattle were exported as against 10,810 a year ago; 7,790 sheep and lambs compared with 3,532; and 4,584 pigs against 2,046. Of beef 117 tons were exported against 41 tons a year ago. Pork exports rose from 1,173 to 1,372 tons; and those of hams from 993 to 1,109 tons; while bacon exports, at 2,238 tons, show an increase of 34 tons. There was little change as regards eggs—the exports having been 3,103 tons against 3,030. Imports, however, fell from 489 tons to 139 tons.

Of butter 81 tons were exported and 1,402 tons imported, the corresponding figures being 65 and 1,269 tons respectively. Of fruit 2,279 tons were sent across the water, an increase of 98 tons. Exports of potatoes show a heavy fall from 51,580 tons to 41,120 tons; the imports being seven tons against twelve. Of fresh fish 159 tons were exported, a rise of 66 tons, and 1,082 tons imported, compared with 996 tons.

Of manufactured tobacco 731 tons were shipped and 354 tons landed, the corresponding figures being 745 and 358 tons. The imports of unmanufactured tobacco came to 908 tons, against 883 a year ago. The imports of pipes are returned at two tons, a decrease of one ton. The exports of whisky were 1,189 tons, compared with 943 tons, while 203 tons were brought in against 182 tons.

Ale and beer imports came to 621 tons, against 511 tons, while the exports totalled 14 tons, an increase of eight tons. Imports of wire are given at 764 tons, compared with 579 tons, and exports at 14 tons, a fall of one ton. Of aerated waters 1,157 tons were exported, a drop of 192 tons, and 12 tons imported against 18 tons.

RISING PORT TRAFFIC.

Mr. R. E. Herdman, D.L., the chairman of the Belfast Harbour Board was fully justified in expressing at the last meeting of the Board his gratification at the increase of traffic at the port and to find that it was divided over coastwise and cross-channel as well as foreign traffic.

The figures, which were presented by the Harbour Master, showed that 294 vessels arrived at the port between 19th May and 1st June, as follows:—Coastwise and cross-channel, 274; foreign, 20; non-trading, 1. The total tonnage of vessels from 1st January to 1st June was:—Coastwise and cross-channel, 1,002,438, an increase of 67,670 as compared with the corresponding period in 1928; foreign, 247,948, an increase of 15,020; non-trading, 41,503, a rise of 6,675; total, 1,291,889, an increase of 89,365.

Port Dues in Yugoslavia.

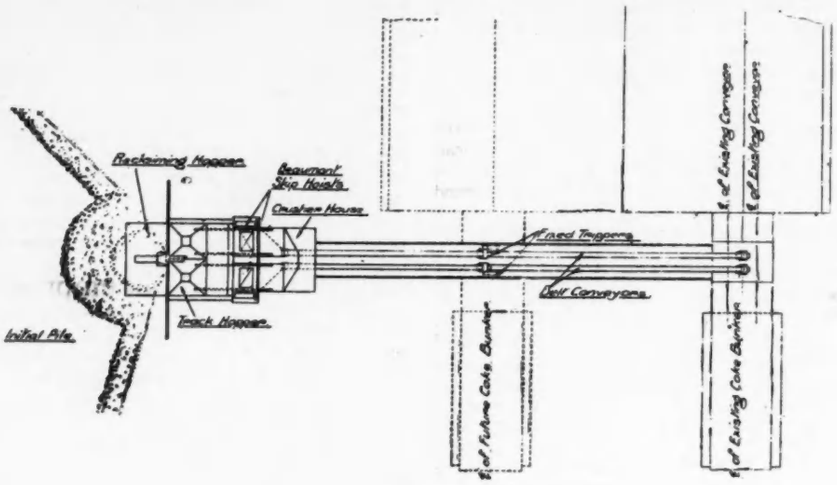
Prevailing Rates of Exchange.

The Department of Overseas Trade has received from the Commercial Secretary at Belgrade the following list of official rates of exchange for the payment of port dues in Yugoslavia during the month of June, 1929, which have appeared in the "Official Gazette" of May 28th:—

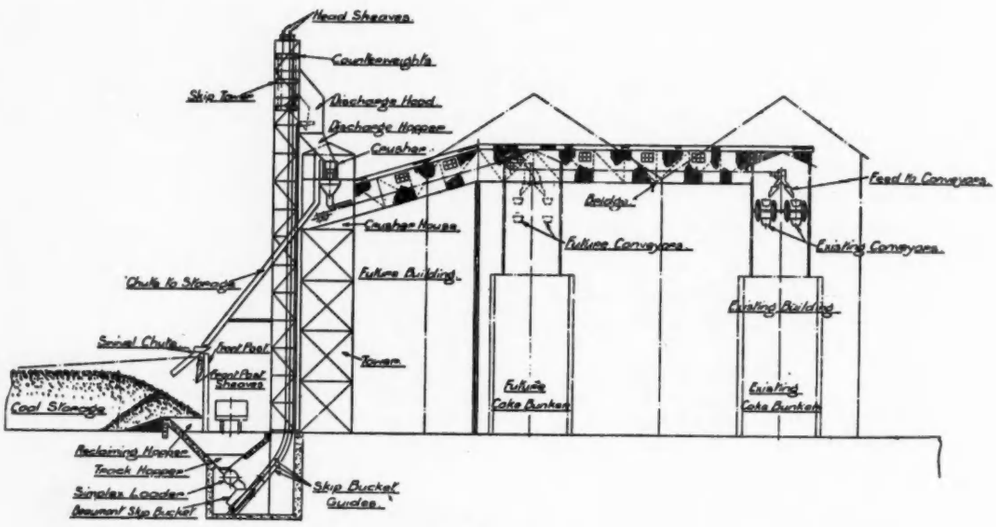
	Dinars.
1 Gold Napoleon	218.00
1 Pound Sterling	276.00
1 American Dollar	56.80
1 Canadian Dollar	56.50
1 German Mark, gold	13.53
1 Austrian Shilling	8.00
1 Belga	7.90
100 French Francs	222.30
100 Italian Lira	298.00
100 Dutch Florins	2287.00
100 Roumanian Leis	33.70
100 Danish Crowns	1513.00
100 Swedish Crowns	1517.00
100 Norwegian Crowns	1514.00
100 Spanish Pesetas	808.00
100 Greek Drachmas	78.80

Personal enquiries regarding shipping and transport matters should be made at the City Office of the Department (Shipping and Transport Section), 73, Basinghall Street, London, E.C.2.

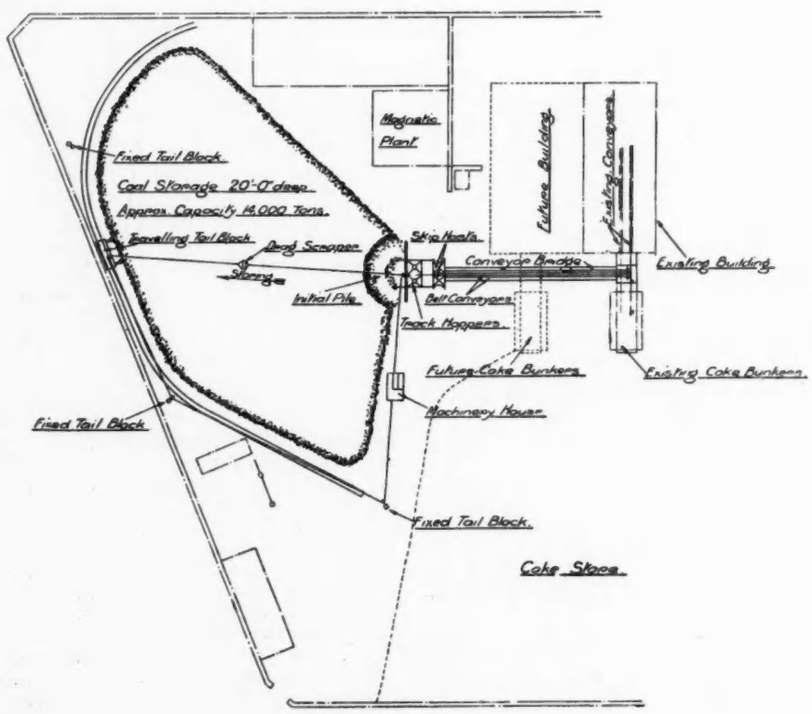
Modern Mechanical Coal Handling.



Plan.



Side Elevation.



Site Plan. Scale—1: 500.

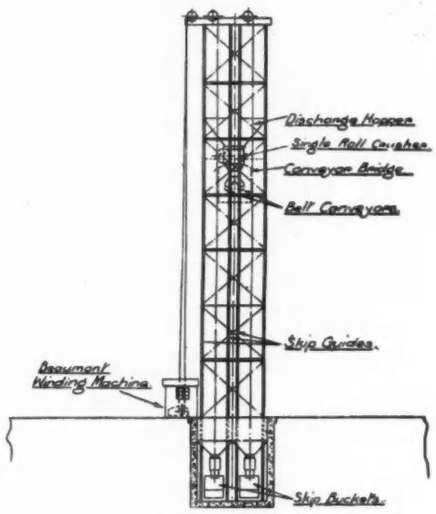
Modern Mechanical Coal Handling.

A Fine Installation according to the Drag Scraper Principle.

During the past few years striking progress has been made in the field of mechanical handling, especially coal, a subject of primary importance to many industries. Some information of considerable interest to dock and harbour works has now been made available concerning the " Beaumont " drag scraper conveyor, and in particular an installation supplied to the Primitiva Gas Works in Buenos Aires, by the Underfeed Stoker Co., Ltd.

The coal used is " run-of-mine " bituminous, arriving at the works in railway wagons, with discharge to a concrete track hopper below the ground level from which it is conveyed either to a storage dump or direct to the retort setting.

For the latter conditions the equipment consists of an electric driven " Beaumont " automatic skip hoist with " Simplex " patent loader, which cannot be flooded or under-loaded for the continuously running small wagons or skips, taken up vertically by an endless wire rope, operated by an electric motor. The normal capacity of this skip hoist is 70 tons of coal per hour, discharging to an overhead steel plate bunker, the whole arrangement being carried by a girder work tower. From the bunker the raw coal discharges through a " Norton " coal crusher, also with a capacity of 70 tons of coal per hour, down to 2-in. size, also electric driven. This passes the crushed coal to an endless belt conveyor, travelling over the top of the retort setting, discharging to any of the retorts as desired, the belt being 115-ft. long between centres, and 1-ft. 6-in. wide, running at 300-ft. per minute driven by a 5 h.p. electric motor with a capacity of 70 tons per hour. A second belt conveyor will be installed when a future additional bunch of retorts is erected, the skip hoist plant being designed to serve two parallel belt conveyors.



End Elevation.

Particularly interesting is the coal storage dump arrangement adjoining the skip hoist, which discharges by an overhead bye-pass chute in the opposite direction any desired amount of the coal to one corner of the dump instead of to the " Norton " crusher and belt conveyors. This coal for storage is spread over the entire area, having a capacity of 14,000 tons of coal 20-ft. deep, and reclaimed again to the concrete track hopper when desired for supply to the skip hoist cable by means of a " Beaumont " drag scraper conveyor having a normal capacity of 100 tons of coal per hour with an average haul of 100-ft.

It is now well known that the Underfeed Stoker Co., Ltd., have taken over the sole manufacturing rights in Great Britain and the British Empire of all the well-known " Beaumont " mechanical handling appliances, particularly the skip hoist and drag scraper conveyors, supplementing their " Usco " water sluice ash conveyors and other equipment. The field covered is extensive, not only coal, coke, and ash, but also sand, clay, limestone, crushed ore and other materials in docks, harbours, gas works, cement works, power plants, steel mills, foundries, glass plants, sugar refineries, potteries and many other establishments.

As regards the " Beaumont " drag scraper conveyors, this is made in standard sizes from 20 to 600 tons per hour capacity, as indicated taking coal off the pile or putting it on as required, with an average haul up to 100-ft., applicable to a site of any shape, circular, square or irregular. The essential principle is that of a large heavy steel bucket or scraper which lies on the top of the pile, partly penetrating, and by means of cables is caused to pass backwards and forwards over the complete surface, operating from a tower at one end, and a series of suitable tail block posts at the other. Or a travelling carriage device or tail block car of heavy steel framework may be used, running on rails round the outside of the storage area and fixed at any point by clamping down. Both these methods are installed at the Primitiva Gas Works, the whole arrangement being electric driven with a rope speed of 250-ft. per minute, and the large travelling cable scraper rapidly pulls the material off the pile or deposits it again, as operated by an electrically-operated winding device, by an attendant from a cabin overlooking the dump.

Many advantages are claimed for this drag cable system as against steam or electric driven cranes or overhead telphers for example, including lower capital costs, simplicity, rapidity of operation and ability to operate dumps up to 150,000 tons of coal.

Large Harbour Developments in Canada.

The Dominion House of Commons has passed Bills providing for loans to various Harbour Commissioners in Canada, the total amount involved being $29,000,000. This sum includes $10,000,000 to be expended by the Montreal Harbour Commission; $10,000,000 for the Vancouver Harbour Commission; $5,000,000 for the Halifax Harbour Commission; $2,000,000 for the Three Rivers (Que.) Harbour Commission and $2,000,000 for the Chicoutimi (Que.) Harbour Commission.

Developments at Montreal include the expenditure of $2,000,000 on the construction of three new berths at Laurier Wharf; reconstruction of the King Edward and Laurier Wharves at a cost of $2,000,000; the extension of the railway electrical system to the eastern section of the Harbour, to cost $1,500,000; extension of grain conveyor system, $1,000,000; industrial wharves, $500,000; new berthing facilities, $2,000,000, and the acquisition of lands, $1,000,000.

At Vancouver, $3,500,000 is to be spent on a new ocean pier, and $1,500,000 for wharves to be used by vessels in the coasting trade, for a fish wharf and a fish storage, cold storage and grain jetty, etc. Important additions to grain-handling facilities are provided for in proposed increases in the capacity of the Harbour Commissioners' No. 1, No. 2 and No. 3 elevators, these extensions aggregating 7,500,000 bushels storage capacity, and involving an expenditure of $3,000,000. For redemption of Vancouver Harbour Commission matured mortgage notes, a sum of $1,950,000 is provided.

The need for the extension of facilities at Vancouver is illustrated by the fact that in 1928 grain deliveries at Vancouver amounted to 97,250,548 bushels, as compared with 55,000,000 bushels in 1924. Deep-sea ships going into the harbour in 1927 totalled 1,100, and in 1928 there were 200 more, the total being 1,300.

At Halifax, $3,741,500 is to be expended on the erection of Pier " B." Transit sheds on Pier " A " are to cost $440,000, a proposed revetment wall $400,000, and a million-bushel addition to the grain elevator $300,000. The total programme for improvement of the Halifax terminals amounts to $5,400,000.

Three Rivers, included in the votes of money for harbour development with an amount of $2,000,000 for the provision of seven additional berths, is an important manufacturing city on the St. Lawrence River. The port also serves Shawinigan Falls, Grand 'Mere and other growing industrial towns. At Chicoutimi, which is an important port at the head of navigation on the Saguenay River, the Harbour Commissioners propose to extend the wharf at present under construction for an additional 2,400-ft., which is the purpose of the loan of $2,000,000 to the Chicoutimi Harbour Commission.

NAVIGATION IN FOG.

Following the recent announcement that the Institute of London Underwriters has agreed to suspend the additional premiums charged on the insurances of vessels calling at St. John, New Brunswick, when equipped with wireless direction finding apparatus, the following report just received from a ship's Master on the value of the wireless direction finder for ship's navigation in Northern European waters is of interest.

Describing his experiences with a Marconi Direction Finder, the Master of a foreign steamer trading regularly to North Sea ports, writes that the instrument " is worthy to be on every ship navigating in the Baltic Sea and in the North Sea, where there is so much fog and bad visibility."

His report that bearings taken even from distances exceeding 100 miles have had " an appalling accuracy," while amusing as an instance of a foreigner's choice of English, is vivid in its meaning. By the use of the direction finder, he says, he knew exactly when to drop the lead to get his expected soundings in thick weather during a North Sea gale.

The stations upon which he obtained bearings were Scheveningen and Humber, and although the first of these was never nearer than 100 miles, the bearings obtained always coincided with those taken on the Humber station.

North-East Coast Notes.

The improved trade outlook in the North is finding definite expression in a steady growth of the coal industry on the northern rivers and, contrary to expectation, the advent of warmer days has not seen that decline in shipments that was not only predicted, but in many quarters believed imminent. To the Tyne and Tees as well as Blyth the coal trade is the basis of all activity and prosperity and the growth of business —with the Continent especially—has been welcome. At the last meeting of the Tyne Improvement Commission it was reported that coal and coke shipments from the Tyne were greater by over 1,000,000 tons in the first four months of this year than in the corresponding period last year, but they fell short of 1913 figures by more than 250,000 tons. From January 1 to April 30 the total was 6,162,706 tons, as against 5,067,228 tons last year, and 6,448,285 tons in the first four months of 1913. Thus there was an increase over last year of 1,095,478 tons, or 21.62 per cent., and a decrease on 1913 of 285,579 tons, or 4.43 per cent.

DE-RATING ADVANTAGES.

At the same meeting reference was made to the prospective benefits from de-rating by the chairman, Sir William J. Noble, who said that shortly the Commission would receive £18,000 in relief under de-rating, and the whole of that sum must be given to dues-payers. A sub-committee of the Finance Committee had been appointed to consider the allocation of that relief. He hoped the Board would give some encouragement to that sub-committee to go somewhat further than the allotted £18,000. His feeling was that the Commission could give relief to the extent of £10,000 to £12,000 in addition to the £18,000 from de-rating. They would be automatically compelled to give relief on October 1, but it would be a good gesture if they started some of it on July 1 as relief in dues at the Swing Bridge. The larger amount of relief might begin on January 1 next year. Newcastle Corporation Quay would benefit under de-rating by £5,000 a year, and he had had a talk with Alderman Lee, Chairman of the Trade and Commerce Committee of the City Council, and had told him what the Commissioners had in mind, and Alderman Lee was in full accord with this feeling. Trade was improving, and they wished to help industry.

MILLION POUND SCHEME.

It was reported that the Commission's new Bill had received the Royal Assent, and Sir William Noble stated that they had had in mind for some time developments at Jarrow Slake, and borings were now being made to find out exactly what was the best method for developing that part of the river. So far as they could estimate at present the initial expenditure would amount to £1,000,000, but they had reason to hope that they would get assistance from the Unemployed Grants Committee. They had information that where extra facilities were given increased trade followed.

He added that an important Shipping Line started a service between the Tyne and the West Coast of North America, and it had received very definite encouragement. There was now a service of one boat a month, with the assurance of from 3,000 tons to 4,000 tons in exports for each vessel, and there was almost a corresponding amount in imports. The Commission had been in touch with the Conference Lines as to bringing more cargo liners to the Tyne, but this was dependent on the amount of cargo available.

Notable visitors to Tyneside at the latter part of May were the members of the Alliance Francaise who held a conference in Newcastle. During the proceedings M. Watier, director of Seaports and Inland Waterways at the French Ministry of Public Works, made the important announcement that the dues on coal imported into France would not be increased. It was reported that the coal trade with France was markedly increasing, and from Tyneside 250,000 tons more coal had been imported to that country than in the corresponding period of last year. At the banquet subsequently the French Ambassador (Comte de Fleuriau) said France was emerging from its industrial crisis, and giving evidence of that by increasing purchases from Tyneside.

LEITH VISITORS TO TYNE.

Several members of the Port of Leith Commission paid a visit of inspection to the Tyne in the early days of June as guests of the Tyne Improvement Commission. They surveyed the river, visiting first Dunston and Derwenthaugh coaling staiths, and thence, proceeding down the river, they inspected the graving-docks, shipbuilding yards and staiths, as well as the oil installation at Jarrow. Sir William Noble welcomed the visitors at lunch, and said that he shared in the general belief that trade was undoubtedly on the uplift. Sir Malcolm Smith, one of the visitors, expressed gratification at what they had seen, and declared that the Tyne had recovered to a phenomenal extent.

The falling off of coal shipments from the Wear was emphasised by the report of the Traffic Committee of the Wear Commissioners, presented at the May meeting of the authority. It showed that 210,635 tons fewer had been loaded than in the corresponding three months of last year, and that the total shipments of 1,290,641 tons was 14 per cent. less, which was attributed to mining difficulties at the collieries, sickness among miners, and other causes.

TEES-SIDE PROGRESS.

Cleveland iron and steel industry is making steady progress and seems able now to hold foreign competition, and there continues to be recorded a steady diminution of imports. During May the imports totalled only 10,686 tons as compared with 16,780 tons in April, and 21,207 tons in May last year. For the seven months ended May 31 last, the imports amounted to 102,939 tons as against 154,145 tons last year.

The beginning of May saw the inauguration of the newly constituted Tees-side Chamber of Commerce, and Alderman B. O. Davies, of Redcar, was elected its first president. The new chamber has been formed by the amalgamation of Stockton and Thornaby and Middlesbrough Chambers. Councillor W. H. Crosthwaite (Middlesbrough), Mr. Leonard Ropner (Stockton), and Mr. Tyson Hodgson (Stockton) were elected vice-presidents.

PERSONALIA.

The Committee of Lloyd's Register of Shipping have appointed Mr. T. Shaw to the principal surveyorship at Newcastle and Dr. Pickworth to succeed Mr. Shaw as principal surveyor at Sunderland. Mr. Shaw obtained his practical experience at Messrs. S. P. Austin and Son, Ltd., Sunderland, and the Construction and Armaments Co., Ltd. He joined Lloyd's Register in 1899. Dr. Pickworth received his training at Messrs. Ropner and Sons, and Messrs. Workman, Clark and Co., Ltd. He was awarded the degree of Doctor of Science for special research work on the important question of corrosion.

A figure formerly well-known on Newcastle Quayside has been removed by the death of Mr. James Cole at the advanced age of 85. He had been closely identified with commercial life for more than 50 years, having been connected with Palmer, Hall and Co., and John Hunter and Co., and for some time was local manager of Hugo Stinnes and Co.

Newhaven Harbour.

Messrs. Stothert and Pitt, Ltd., of Bath, England, have recently been entrusted by the Southern Railway Company with a large contract for the above port, totalling over £20,000 in value and comprising the following:—

Six Travelling Electric Wharf Cranes, each to have a lifting capacity of 3-tons on single rope at 35-ft. maximum radius, at a speed of 200-ft. per minute, and to travel on a 9-ft. gauge track. Separate motors will actuate the several motions of hoisting, slewing, luffing and travelling, and the " Stothert and Pitt " patent horizontal jib luffing system is embodied. The superstructure is to slew on a ring of live steel rollers, and the hoisting control is on the " Laurence Scott " patent " floating brake system."

One Fixed Electric Wharf Crane, with a lifting capacity of 15-tons at 35-ft. maximum radius, and mounted on a steel pedestal, giving a height of lift of 40-ft. above ground level. Separate motors for hoisting, slewing and derricking, the latter motion to be performed with no load suspended. Slewing to be actuated on a ring of live steel rollers, and potentiometer control provided for lowering the load.

One Fixed Electric Platform Crane, with a lifting capacity of 2-tons at 32-ft. 6-in. fixed radius, with separate motors for hoisting and slewing. The total range of lift (above and below deck level) to be 70-ft., and control to be effected from a platform on the top of the superstructure framing.

Electrification of Three 3-Ton " Stothert and Pitt " Steam Gantry Cranes, 35-ft. maximum radius, 9-ft. gauge track. The existing boiler and engines to be replaced by a single 50 b.h.p. motor driving the several motions of hoisting, slewing, derricking and travelling, by means of sprockets and chain.

Four Electric Capstans. To each exert a pull of 2-tons at 100-ft. per minute, the bollard to be driven from a 20 b.h.p. motor through high efficiency worm gearing. One feature of this design of capstan is that the box is cast in one piece, thus having no large joints below the ground level, and providing excellent watertight protection for motor and gearing. A powerful mechanical brake is provided, and the starting gear is of the pedal operated contactor type.

The electric supply throughout is direct current, 480 volts.

THE PORT OF HAMBURG.

The cold storage warehouse constructed by the State of Hamburg in the free port is now finished and will be opened shortly. The work has taken a year to complete and is designed specially for the storage of salted herrings. Barrels can be loaded and unloaded direct from ship to shed and from shed to truck without land transit.

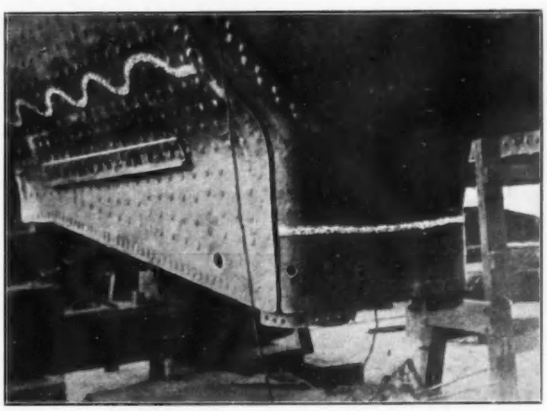
Electric Arc Welding in Industry.

WHEN two or more pieces of metal are fused together by the intense heat of an electric arc, interpenetration takes place, and upon cooling, they become as one piece—this is arc welding.

Direct current produces a hotter arc than alternating current; for the general run of metallic arc welding, from 20 to 25 volts. will maintain the arc, although a higher voltage is required to strike it. The usual current-flow will range between 50 and 300 amperes. The general practice is to attach the parts being welded to the positive side of the circuit and to attach a filler rod with suitable handle to the negative side of the circuit. When the arc is established by quickly striking the filler rod against the work, fusion takes place, and molten metal from the rod is deposited with the molten parent metal or metals. As the point of operation is moved along, the molten mixture cools behind the arc, and the weld is formed. A special type of direct-current generator is required for satisfactory welding, and it may be driven by a motor, by a gasoline engine, or by a belt from a line shaft.

With experience, operators acquire great skill in making strong, neat, welds. They soon become proficient in making welds in all positions, including "overhead," and they learn to build up deficient parts, to weld thin sections, and to avoid warping, straining, or misaligning the parts being joined.

The earliest applications of arc welding were largely confined to making repairs on broken machinery or equipment. Then it was found feasible to build up worn parts for remachining. The next step included the fabrication of simple equipment using pipe, angles, plates, and the like for making up production aids or shop conveniences.



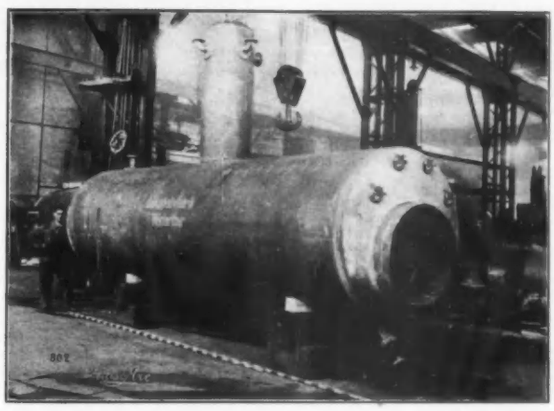
Locomotive Boiler Repair, showing Locomotive Boiler after welding new portion of wrapper plate. The view also shows a new portion of the external Back Plate of the Firebox welded in position. This boiler has been in service for about 3 years and is working satisfactorily. Entirely welded with "Quasi-Arc" Electrodes.

A decided step in advance was taken when arc welding entered into regular production work. At first, the art supplemented standard practice, or imitated former shapes and styles of products. It was soon found that arc welding possessed characteristics of its own which gave the maximum benefit when designs from the beginning were made to take full advantage of its wonderful possibilities.

At this time arc welding is performing all its older duties most satisfactorily, and—still more important—it has supplanted older methods of construction in many lines with outstanding success. Its advantages may be summarised by simply noting that it saves time, reduces costs, minimises weights, and increases strength.

Arc welding may be done either by hand or by the automatic method—many kinds of work require both. In the hand method, a short piece of electrode wire is guided and fed by hand; while in the automatic method, the electrode is a long wire fed from a reel, and the arc is automatically maintained and progressed. The electrode is fed at a rate determined by the current flowing through the arc, and the "welding head" may travel over stationary work or the work may travel under a stationary head. Automatic welding is used on long, unobstructed straight seams, or on seams that are arcs of circles. It also is used for building up where there is a relatively large unobstructed space to be filled. The hand method is used on short or irregular seams or for repairs and small building-up jobs.

Any industry that uses ferrous metals to a great extent in its products is likely to have a place for arc welding, particularly if thought is given to possible changes in design and procedure to take full advantage of welding. Any industry that uses much machinery, equipment, or metal apparatus can certainly use arc welding to make repairs, to salvage worn parts, and fabricate shop equipment.

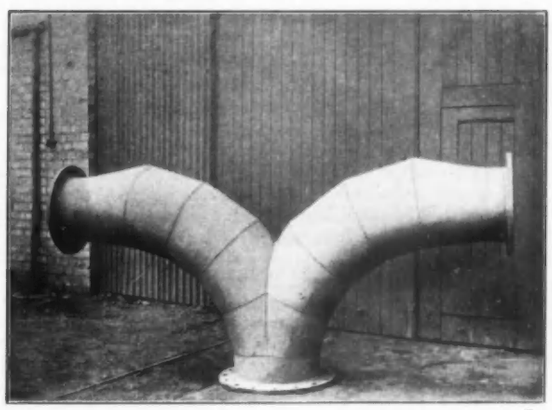


High Pressure "Cornish" boiler, completely welded with "Quasi-Arc" Electrodes. Overall length 21-ft. 4-in., diameter 5-ft. 2-in., plates ⅞-in., test pressure 290-lbs., heating surface 430 sq. ft., working pressure 190 lbs. Built by the Locomotive Works, Winterthur, Switzerland. December, 1925.

Repair work presents an endless variety of arc-welding applications that make welding apparatus indispensable once it has been put to such uses. "Repairs" may apply to emergency cases where it is essential that equipment be put back into operation with minimum delay. Shafts, gears, frames, and bases for machinery are in this class, since renewal parts are not usually carried for them. Another class of repair work includes parts that are immediately replaced by new or previously salvaged parts and which may be repaired as routine work. This class includes pinions, collars, clamps, clutch parts, and similar small articles that can be saved from the scrap heap at small cost.

Reclaiming is another phase of arc-welding usefulness. In this class of work, arc welding is used as a "putting-on tool." Worn shafts are built up for re-machining, worn guides are made as good as new; in fact, wherever excessive wear has rendered a machine or device unreliable or inoperative, the electrode will, in a few minutes, put on more than has been worn off in years.

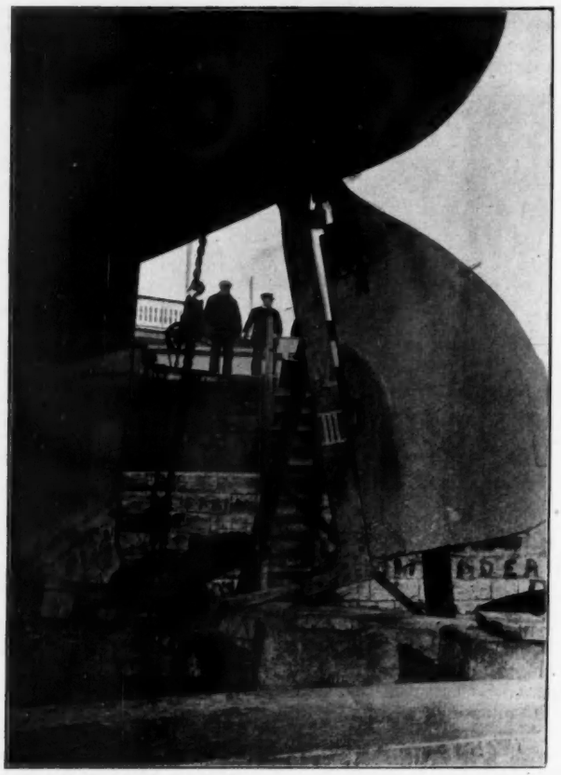
Defects in new castings or in steel parts are easily filled by arc welding without interfering with machining. Since an actual weld takes place, the filled-in metal is secure, and the piece is made as strong as though no defect had existed. This feature will often save not only the piece but also the machine work that has been done upon it before discovery of the defect. The ability of the electric arc to cut metals is frequently utilised in repair work. By substituting a carbon electrode for the metallic electrode, the arc can be used to cut away defective parts prior to patching, and patch material can be cut to fit. Work of this character is done on containers such as annealing boxes and tote boxes. Equipment subject to abrasion, such as power shovels, drag-line buckets, conveyor flights, and the like, is reclaimed by cutting out thin parts and cutting patches to fit; then, by changing to the metallic electrode, the patches are securely welded into place.



Y-piece, Exhaust Steam Pipe, Easy Flow, constructed with "Quasi-Arc" Electrodes.

An example will serve to show how versatile the arc becomes in the hands of one possessed of ingenuity. A concrete machine foundation was built with foundation bolts in

place. When the machine was delivered, it was found that the bolts did not come up through the base. Bolt extensions were welded on in a few minutes, thereby saving the bolts, the foundation, and time.



Ship Repair, showing broken stern frame and rudder of the steamship "Mongeham."

Welding equipment can be employed profitably in making shop equipment, such as stands, tables, stools, ladders, cabinets, and various special devices needed temporarily or permanently. Many simple devices are made from scrap stock, while other apparatus is carefully designed and built from new material. Stools, ladders, radiators, belt guards, hand rails and supports of various kinds are usually built from scrap pipe, and exceedingly strong devices can be fabricated in this way. Tables, truck bodies, grills, frames, jigs and forms more often utilize angle and channel sections, which, when properly cut and fitted, readily weld into rigid but light structures. Truck wheels are made up by welding a tyre around a plate web to the centre of which a block is welded for a hub. Special trucks in great varieties suited to the economical handling of products, are constructed at low cost by welding, and the savings effected go on for years. Steel sheets and plates enter into containers of many kinds, such as tote boxes, dipping vats, cupboards and lockers. All such equipment can be made on the job to suit the immediate requirements, and the space limitations—and it will often prove better and less expensive than if purchased.

So-called "tack welding"—temporary fastening by welding in very short spots—is often resorted to in setting up temporary jigs or forms when assembling a few duplicate products. These may consist of a base plate to which are tack welded short pieces of angles or other shapes. Long clamps are sometimes needed to bring parts together, and the welder makes them as needed by welding nuts against opposite sides of an angle iron. A bolt is secured through one nut, the other hooks over the work, and the clamp is ready—time, six minutes.

Die work is another field of usefulness for arc welding in shops. Larger dies in the rough are built up by welding, and worn dies are reclaimed in the same manner. Die parts for bulldozers are fabricated by welding.

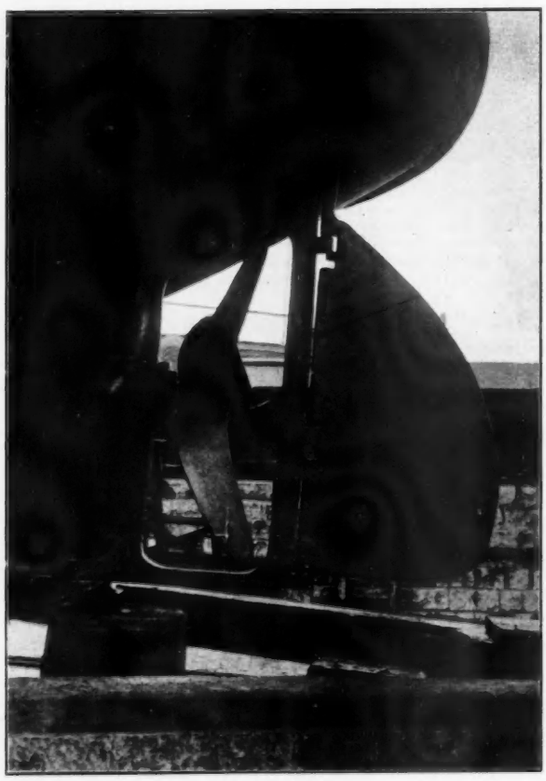
It is impossible to enumerate all of the shop equipment that has been produced by arc welding. Go through any shop where welding is used and observe the amazing variety of welded equipment that has come into being as a matter of course. With an ingenious operator and welding equipment at hand, conveniences are constantly being added to many shops.

Steam and electric railway shops are making extensive use of arc welding for new construction and for repair work. The scope of this art in the rail transportation field includes track work as well. There are two outstanding features that make arc welding almost indispensable here; they are the eminently satisfactory work done and the exceptionally low cost entailed. The low cost is most noticeable in connection with locomotive repair work, and is made possible by the practice of repairing parts in place—sometimes even with steam up. Any other method of repair comparable with electric welding would require putting the unit out of commission, removal of the defective parts, and replacement after repair. In one shop, 417 cylinders were reclaimed by arc welding and put in service without a single failure in over two and a-half years. Fire boxes and boiler tubes repaired by arc welding stand up successfully under exceptionally hard service. The practice of building up worm services for remachining includes rail ends, wheel flanges, side frames, valve-motion parts, cylinder heads, and many other items. The deposited metal machines well and withstands wear as well as the parent metal.

Leaks of various kinds can be stopped by welding, with invariably good results. Cauking tubes, stay bolts, and plate joints by welding is quicker and far more thorough than by ordinary cauking tools, even in the hands of an expert. Cracks in metal are repaired by chipping away a liberal opening with firm metal edges and filling in the opening with metal deposited from the electrode. These repairs are more quickly executed, are more satisfactory, and are neater than patching with riveted plates. A new welding operation has come to prominence in the fabrication of metal ties. In this process scrap rails are cut to suitable lengths and are fed in pairs to an automatic arc welding machine. The two sections of rail are welded together and fitted with tie plates, and the ends are further reinforced by angle bars. The machine turns out a tie every five minutes.

Electric railways have widely adopted arc welding for rail joints. This type of joint insures long life because the secure fastening precludes separation and consequent wheel pounding. Arc-welded rail joints also do away with bonding, as a continuous circuit is provided by what is virtually a single rail from terminal to terminal. The electric roads make extensive use of arc welding for building up worn anxles, flat wheels, and broken or worn flanges. High-carbon steel electrodes are used where hard wear is to be encountered by the filled-in metal.

Manufacturers of machinery are making the most radical changes of years in machine construction through the adoption of arc welding. Machinery of widely differing classifications is constructed by welding together plates, shapes and pre-machined parts instead of using castings or riveted or bolted structures. The new construction enonomises material and weight by utilising the greater strength of steel—by building up to its high invariable values rather than down to the weakest of values of wide and uncertain range. The weakening effect of rivet holes is avoided and many parts, such as gussets, necessary in a riveted job are eliminated.



Ship Repair, showing stern frame and rudder of the steamship "Mongeham" after repair by welding with "Quasi-Arc" Electrodes.

Arc welding has made astounding strides in the manufacture of electric machinery from the very largest waterwheel-driven generators down to the details of small control units. Many types of heavy machine tools are being re-designed to make use of steel plate and of standard shapes fabricated by welding.

On many types of machines which have heretofore been built, in large part, of angles, channels and plates riveted together, the arc weld is now utilised for making permanent joints. This practice saves considerable material and time, and results in a stronger machine of reduced weight. In this class of apparatus are screening, sorting and grading devices used in ore dressing, rock-products plants, and coal tipples. Concrete mixers and various other mixing, agitating and conveying mechanisms are included in this new method of construction.

Where machines are made largely to order and in small numbers, castings may well be dispensed with, because the major portions of these, now made of castings, can be fabricated by welding at a cost lower than that of patterns alone.

Until recently, iron and steel castings were considered all that could be desired; and indeed their usefulness is by no means at an end, for castings will probably occupy important places in design for generations to come. Until metallic arc welding was brought to its present high state of development, fabricated steel replaced castings in only a few machines. Now that the means is available, the rapidity with which castings are being displaced is accounted for by the many advantages of fabricated steel over castings. For the same weight, structural steel is stronger than a casting. Its use eliminates pattern making, pattern storage, casting and failures that take place in the latter operation. It is also more readily machined; and, because of its uniformly better magnetic properties, the same flux can be produced in it with less excitation.

The designer finds a new freedom, for he no longer seeks to fit his new design to existing patterns. New shapes and new dimensions are thought of, in respect to time and cost, merely as new drawings. It is true that he must exercise greater ingenuity in order to make the best use of standard materials to the end that the requirements of utility, economy and appearance shall all be well served. But give him only a small fraction of the time that has been devoted to the development of this present degree of skill in the utilisation of castings, and he will be planning fabrications that are far beyond the practice of to-day.

Fabrication by arc welding is one of the most outstanding developments in the history of machine design—its economic importance can hardly be over-estimated.

Pipe fittings, simple and complex, are now being welded on the job to suit local conditions. This practice applies in high-pressure pump service about vacuum and pressure stills, and wherever economy of room, freedom from leaks, and reduced fluid friction at bends are important features. The welding outfit will eventually be considered as indispensable as the pipe cutter wherever much pipe fitting has to be done.

Metal containers are employed in the industrial arts and in business in vast quantities and in a great variety of forms. There are millions of milk cans and ice cream cans in the country and their number is probably exceeded only by metal barrels and drums. Some of the finest examples of automatic welding are found in plants where these containers are made.

Tanks include a great variety of containers, among which may be noted those now largely fabricated by arc welding, such as underground petrol tanks, city gas tanks, oil tanks in field and refineries, water and oil wagon tanks. In industrial plants, welded steel tanks have supplanted riveted and cauked-plate tanks or cast iron tanks for innumerable applications. In this class may be included tempering baths, dipping vats, liquid storage process containers, and refuse cans.

Among pressure vessels, perhaps the class most generally welded and for which practically all manufacturing processes are automatic, is the range boiler used in domestic hot water systems.

Oil refineries and natural petrol plants utilise great numbers of arc-welded vacuum and pressure vessels in the way of stills, condensers, coolers, and heat exchangers. Producers of oxygen, acetylene and hydrogen make use of many welded pressure vessels, and they, as well as the oil refiners, look upon welded joints as a very practical means for reducing the hazards common to such plants.

Longitudinal seams and circular seams in containers and pressure vessels are quickly and uniformly welded by welding heads and travel carriages, together with rolling devices and such other special fixtures as may be needed on special shapes.

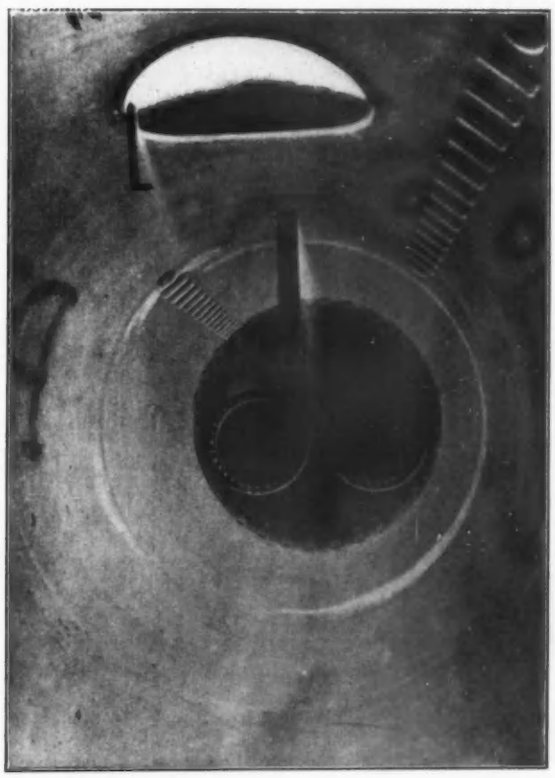
The metallic electric arc welding of structural steel buildings and bridges is well past the experimental stage. Their design can be carefully calculated in advance, and where the process is applicable, many well-defined advantages and manifest economies can be achieved. It is not to be expected that arc welding will supersede other known forms of building, but it has many definite general uses, and should be seriously considered by designers, fabricators, and engineers. It should be excluded in those cases in which it is apparently not suitable; but it will be used to a great extent, as is evidenced by the increasing number of arc-welded buildings, towers, bridges, and miscellaneous steel structures.

The heaviest and largest steel building thus far entirely fabricated by arc welding was recently completed by the American Bridge Company at the West Philadelphia plant of the General Electric Company. This structure covers 80,150 square feet of ground and contains 989 tons of steel. A few of the construction details follow.

The building involves a number of new design features including a welded roof truss especially designed by the General Electric Company for such applications.

Across one end and connecting to an adjoining building is a high bay, or transept, spanned by seven of the new welded roof trusses, each having a span of about 72-ft. The main wing of the building has a crane bay over which are located 20 of the new trusses, each having a span of about 58-ft. There is also a gallery in an adjacent wing over which there are 20 welded trusses, each of about 80-ft. span.

This method of construction was used because it permits the use of less metal at less expense to withstand a given stress. Were the building riveted instead of welded, larger sections would have to be used, as rivet holes are responsible for a certain loss. This loss is equivalent to a strip of metal the full length and thickness of the part in which the hole is punched and as wide as the diameter of the rivet.



Two Double Lancashire-type Boilers, having 1,076 sq. ft. of heating surface with a working pressure of 192 lbs. per sq. in. Inside diameter 7-ft. 6-in., plate thickness ¼-in. Butt straps outside 6⅞-in. x 2⅜-in. x ¼-in., inside 6⅞-in. x 2⅜-in. x ¼-in., set 8⅜-in. apart, and the straps are situated opposite each other, inside and out. Entirely welded with "Quasi-Arc" Electrodes.

In riveted structures, gusset plates are required to connect the various members at their intersections while, in welded construction, members are directly connected to each other. Experience has shown that these two items alone result in a saving of from 12 to 15 per cent. in the amount of steel required when trusses are welded instead of riveted.

The large trusses used to support the roof on the new building are of particular interest because they involve new ideas in truss design. Each truss consists of two parallel lengths of metal latticed together by a system of tension and compression members. Rivets have heretofore been used to fasten the units together. The common practice was to construct the trusses with angle iron, but, in the new truss, the two parallel members or cords are made of " H " beams, the tension members are of channel iron, and the compression members, " H " beams. All connections are made by electric arc welding.

The General Electric Company, in order to determine the relative holding values of welded joints, has conducted many tests on welded and riveted joints. In one series of tests, welded specimens were made by the General Electric Co., and the actual tests were conducted under the directions of Professor T. R. Lawson, of the Rensselaer Polytechnic Institute, in the laboratory of that institution. The tests were made on ¼-in., 5/16-in. and ⅜-in. fillet welds, this type of weld being commonly used in fabricating steel structures from standard rolled-steel shapes. On each size of fillet there were made tension and compression tests, fillet lengths being ½-in., 1-in., 2-in., 3-in., 4-in., 5-in. and 6-in.

A summary of the results of this test showed that a ¼-in. fillet will stand a safe allowable load of 2,600 lbs. per lineal

inch, using four as a factor of safety. Corresponding values for 5/16-in. and ⅜-in. fillets were 2,900 and 3,200 lbs. It is estimated that a ¾-in. rivet, the standard size, will stand a shearing load of 4,500 lbs. The results of the tests show that a ⅜-in. fillet weld will sustain approximately the same load if deposited for a length of 1½ inches.

The principal elements from which the building framework was constructed were welded in the shops of the American Bridge Co. in Trenton, N.J. These were delivered to the building site; and the remainder of the work, necessary to fabricate them into the form of the completed structure, was done on the spot with field welding. Four portable welding outfits were available for use at Philadelphia, but it was found that only two were needed most of the time, three being used occasionally. Only one operator per set was needed to do the work. Setting the steel in place for welding required the same force of men that would be necessary for any other structural work.

Work was started January 11th, 1928, and the structural frame work was completed by March 1st. It is estimated that more time would have been required if the building had been erected by the riveting method.

Most of the welding was done with ⅜-in. fillet welds, 5/16-in. fillets being used to some extent at various times. Standard welding sets, each including a suitable motor-generator set, delivered direct current to the arcs.

Sample roof trusses were constructed by the American Bridge Co., steel contractor in charge of the erection of the new building in Philadelphia, and tests were conducted at that Company's plant in Trenton, N.J. At that time, a live load, double that for which the truss was designed, was placed on the truss, causing a deflection of only 0.26-in. more than at normal load. In this test, three trusses were set up in the plant yard, parallel to each other, the same as in a building, and in such a way that, when loaded, the centre truss would carry the load. Deflection readings were taken by means of a fine piano wire held at the ends of the truss and kept taut, a scale graduated in tenths of an inch being used with a mirror to show the deflection under load. The normal live load for which the truss was designed was 30 lbs. per square foot of total roof surface. As tested, a load was applied equivalent to full dead load plus 60 lbs. live load per square foot of total roof surface. At no time was there any indication of weakness in the structure.

Ceylon and Indian Notes.

COLOMBO PORT COMMISSION.

The Colombo Port Commission has prepared a memorandum to accompany its estimates for 1929-30, showing expenses incurred under various items. The estimated revenue for the period of twelve months from October, 1929, to September, 1930, is Rs.5,838,000, as compared with the estimated revenue of Rs.5,555,000 for the current year. The actual revenue for the first six months of the current financial year has been Rs.3,005,406. The estimated increase is chiefly under harbour dues, warehouse rent, other harbour collections and the revenue of the oil installation. The estimated expenditure for the financial year 1929-30 is Rs.3,628,242, as against the estimate for 1928-29 of Rs.4,410,527, and an actual expenditure during the first six months of the current financial year of Rs.1,974,441. The actual expenditure during the financial year 1927-28 was Rs.4,181,800. Administration charges amounted to Rs.108,652, and the total of personal requirements amounted to Rs.1,079,747.

ADDITIONAL STAFF.

The expenditure of the Colombo Port for 1929-30 has been divided amongst the departments immediately responsible as follows:—

General administration (secretary's department), Rs.108,652; Master Attendant's department, Rs.468,816; and Harbour Engineer's department, Rs. 3,050,774. These three heads make up a total of Rs.3,628,242.

Under the first head—general administration—there is an increase under personal emoluments. Provision has also been made under this head for additional staff.

In the Master Attendant's department, provision has been made for the salaries of the deck crew of the new harbour tug and other general expenses.

Expenditure incurred under the third head—Harbour Engineer's department—shows an increase. Provision has been made for two trained attendants for the Port Commission's motor ambulance.

BETTER COAST LIGHTS.

One by one most of the smaller lighthouses round Ceylon are being equipped with automatic acetylene lights, which are replacing the old-fashioned oil lights. In the course of an interview, Captain E. C. Stubbs, the Colombo Master Attendant, said that automatic acetylene lights will be installed this year in the Hambantota and Batticalo lighthouses, and in the estimates for next year are included an indent for two automatic lights for the Point Pedro and Talaimannar lighthouses.

The installation of these automatic lights in the lesser lighthouses is the result of the success of experiments with these lights conducted last year. In April last year an acetylene flasher was temporarily installed in the lighthouse on the Northern Arm breakwater in the Colombo Harbour, and the experiment was found to be a success. In course of time all the lighthouses round the coast will be lighted by these automatic flashers. These lights work as follows: The light is produced by the acetylene gas in a compartment underneath the flasher coming up in jerks into a glass cylinder, where the light flashes each time the gas emerges, and disappears when the gas is spent. In this manner a series of flashes is produced by the automatic propulsion of the gas into the cylinder, a system which, for small lighthouses, is said to be superior to the present system of revolving cylinders which alternately flash and cut off the light as they revolve through the working of cumbrous machinery. The acetylene light is, besides, cheaper to work.

All the minor lighthouses round the island are in charge of the Colombo Port Commission. The Port Commission, however, have no jurisdiction over the major lighthouses, which are under the supervision of the Board of Trade, England. These lighthouses are: The major lighthouses of Colombo, Beruwala, Dondra, and the two Basses.

BOMBAY PORT TRUST.

In pursuance of an undertaking given by the Trustees of the Bombay Port Trust to offer facilities for Indians to qualify for higher appointments in the mechanical branch of the engineering services, it has been decided at a recent meeting of the authorities to give a special training in the Port Trust workshops to selected apprentices of a high standard of education, whose parents and guardians are able and willing to pay the cost of sending them abroad for completing their course of training. The Trustees also further decided to assist the apprentices in getting them placed for training at suitable works in Great Britain. It was also decided to approach Government, in connection with the recent scheme for granting State scholarships for the training of Indians in marine engineering in the United Kingdom, with a view to enlarging the syllabus of training to include mechanical engineering.

BOMBAY PORT AND MERCHANTS' CHAMBER.

Another matter of importance considered by the Trustees of the Bombay Port at the meeting was the concession of granting a holiday on full pay on the King's Birthday, at present confined to the temporary workshops' daily-paid staff of the engineering department, to the daily-rated temporary staff of all departments of the port. After mature deliberations, the concession was granted as asked for by the workmen.

On the recommendations of the Finance and General Committee, it was also decided by the meeting to grant, subject to certain conditions, an allowance of 10 per cent. of pay to the Port Department lascars and crews to compensate them for the regular work performed on Sundays and holidays.

The Trustees also considered a reference from Government in connection with a representation from the Indian Merchants' Chamber on the causes for the alleged diversion of trade from the Port of Bombay, and decided to inform Government that the Trustees will be happy to co-operate fully in the proposed enquiry to ascertain the exact causes of trade deflection and possible remedies.

" DROPPING " THE PILOT.

The members of the local pilot service recently made representations to the Governor, enumerating certain grievances and asking for redress. One of their demands was that they should be allowed to retire from service when fifty years of age, without producing a medical certificate, if they felt the strain of the work too much for them. They also asked for a special allowance for tropical service.

I understand that the Governor in Executive Council considered the representations, and expressed regret that the Pilots' requests could not be granted. In his report on the subject, Mr. W. E. Wait, the then Principal Collector of Customs, and chairman of the Colombo Port Commission, also held that he did not see the necessity for granting the requests made by the members of the Pilot Service, since they joined the service well aware of the conditions. On the other hand, they had a considerable advantage in obtaining settled employment on shore, with the prospect of a pension at the end of it. Mr. Wait was also not in favour of the special allowance for tropical service, because the pilots really work in healthier surroundings than many other Government servants. Nor is there any reason why they should retire without a medical certificate at fifty. If they feel unfit for their work by then, they could go before a Medical Board. Mr. Wait also observed that there seemed little reason why the pilots should not conform to the ordinary rules of the Widows' and Orphans' Pension Fund. The pensions under the fund are worked out for all on actuarial tables, and it would be manifestly impossible to treat any conditions on a professional basis.

DOCKS AND BUNDER RATES.

Subject to the sanction of the Governments concerned, the Trustees of the Port of Bombay, at a recent meeting, approved certain amendments of the Docks and Bunder scales of rates to provide for a reduced export wharfage on unpacked motor cars for shipment to ports in India, Burma, Ceylon, and the Persian Gulf. A flat rate of Rs.10 per car, including surtax, was also approved for unpacked private cars when owned and accompanied by passengers travelling between Bombay and any Indian or Persian Gulf port.

Certain reductions in the contract and schedule rates for loading imported materials into railway wagons and motor lorries for delivery ex-docks were also approved.

COLOMBO'S NEW SALVAGE TUG.

Captain Daniels, late master of the A. and C. L. "Jervis Bay," who figured prominently in the historical story of eight stowaways who were imprisoned in Colombo on charges tantamount to mutiny, is among the applicants for the position of Captain of the new salvage tug for Colombo Harbour, a description of which I shall give in my next notes. Persistent rumours in Colombo assert that he has secured the appointment, but enquiries at the Master Attendant's office revealed that the Secretary of State has not yet made a selection from the very large list of applicants.

COLOMBO PORT COMMISSION CHANGES.

His Excellency the Governor has been pleased to appoint Mr. M. J. Cary to be an Unofficial Member of the Colombo Port Commission, in place of Mr. C. H. Figg, who has resigned.

KARACHI PORT TRUST CHANGES.

Mr. W. P. Shepherd Barron, Chief Engineer of the Karachi Port Trust, has been appointed to act as chairman, Karachi Port Trust, in addition to his own duties, vice Mr. J. B. S. Thubron, C.I.E., who will be shortly proceeding on leave to Europe.

BOMBAY PORT TRUST CHANGES.

Lieutenant F. H. Otto, I.D.M., is appointed to officiate as Health Officer of the Port of Bombay, in addition to his own duties, vice Lieut.-Colonel W. H. Houston, I.M.S., who is shortly going on leave.

Captain W. M. Macleod has been appointed to be a member of the Board of Trustees of the Port of Bombay, vice Major-General G. A. Weir, C.B., C.M.G., D.S.O., with effect from the date on which the latter relinquished command of the Bombay district.

WIRELESS FROM SHIPS.

A directional wireless receiving apparatus, meant purely for receiving messages from ships, is being installed in Colombo. In a month's time it will be complete. The new apparatus is badly needed for receiving ships' messages, since the apparatus at present employed for the purpose is inadequate in that, if two or three ships are wirelessing simultaneously, a jumble of sounds is heard at the Colombo wireless receiving station instead of a clear-cut message. The new directional apparatus eliminates this confusion by the simple method of cutting out the messages from all other ships but one. Having received the message of one ship, it then goes on to receive the messages of the other ships that may happen to be signalling at the time. The new directional apparatus can also be normally kept "open," that is, open to messages from any direction.

CALCUTTA'S FOREIGN TRADE.

The import trade of Calcutta with foreign countries in April, 1929, showed a considerable improvement over the previous month's figures, the value rising from Rs.7.42 crores to Rs.8.38 crores. Exports, however, did not improve, the value declining from Rs.9.29 crores to Rs.9.10 crores. Compared with the corresponding period last year, both sides gave a better account, imports increasing by Rs.1.12 crores and exports by Rs.1.14 crores.

Cotton goods continued to show a better trade. Twist and yarn increased from 412,000 lbs. to 1,177,000 lbs. in quantity and from Rs.5.96 lakhs to Rs.15 lakhs in value. The total yardage of piece goods expanded from 97 million yards to 100 million yards, the corresponding increase in value being from Rs.2.38 lakhs to Rs.2.41 lakhs. All the principal descriptions, with the exception of white goods, contributed towards the increase. Iron and steel also made a noticeable advance, the bulk of the trade being represented by galvanised sheets and plates. Under the heading grain, pulse and flour, 43,000 tons of wheat were imported from Australia valued at Rs.61 lakhs. Java sent large consignments of sugar, and the quantity of refined sugar increased from 13,000 tons to 25,000 tons, the corresponding increase in the value being from Rs.25 lakhs to Rs.42 lakhs. Mineral oils declined by Rs.12 lakhs, due mainly to the poor imports of kerosene from countries other than America.

The export trade showed a mixed record of rise and fall, the balance remaining in favour. The slight decrease in jute manufactures was actually due to the lower prices ruling, for although the value dropped by Rs.15 lakhs, the total quantity shipped increased from 64,000 tons to 65,000 tons. Java took the largest number of gunny bags, and the United States most of the gunny cloth. Raw jute was in good demand and went mostly to France and the United Kingdom. Germany kept her hold over the hides, and the United States over the skins. Under the heading grain, pulse and flour, the bulk of the trade was done in rice, which found the greatest consumer in the Bahrein Islands. Pig iron, which continued to go mostly to Japan, showed a considerable increase. A feature of the trade was the notable advance made by mica, which received large orders from the United States.

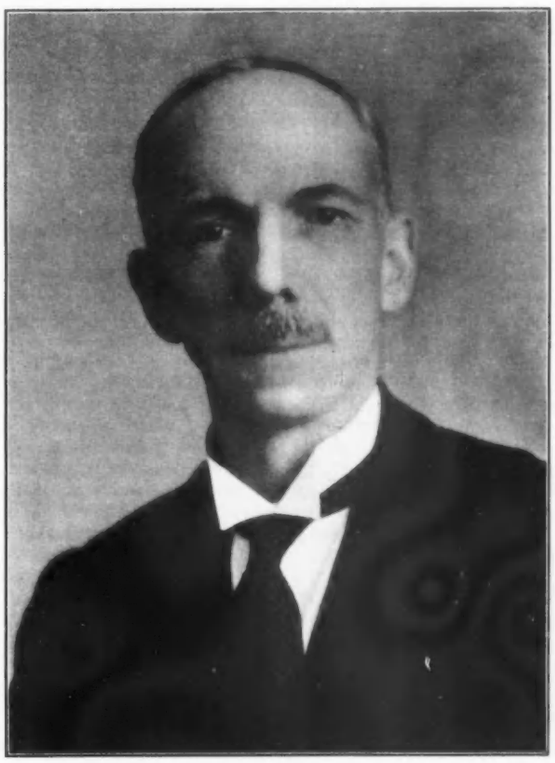
Port of Bristol.

The Bristol City Council, at their meeting on Tuesday, the 11th June, approved the recommendation of the Docks Committee to appoint Mr. Frank Brown, M.Inst.T., to be Assistant General Manager of the Port of Bristol Authority.

Mr. Brown, who is a native of London, entered the service of the London & North Western Railway in 1896, and, after five years' experience in various capacities under the District Superintendent, resigned in 1901 to take up the position of Personal Clerk to Mr. John Macaulay, the General Manager of the Alexandra (Newport & South Wales) Docks and Railway.

In 1903 he was appointed Parliamentary Clerk, being responsible to the General Manager for legal and financial questions and matters of trade policy and development.

In 1908 he organised the Staff Department of the Alexandra Company, and was appointed Parliamentary and Staff Assistant to the General Manager and Secretary to the Conciliation Boards.



Mr. F. BROWN.

In 1916 he became Chief Assistant to the General Manager of the Alexandra Company.

At the amalgamation of the railways under the Act of 1921, by which the South Wales Railways, including the Newport Docks and Railway undertaking were amalgamated with the Great Western Railway, he was appointed Assistant to the Chief Docks Manager, and in 1926 he became Assistant Chief Docks Manager, the responsibilities of the Department extending to the working, management and general administration of all the large South Wales Ports, of Plymouth, and certain subsidiary dock undertakings.

During his 33 years' experience, Mr. Brown has gained a thorough and all-round knowledge of every branch of dock and railway work, his duties having embraced Parliamentary, Railway Commission and arbitration work, staff matters, railway and dock rates and charges, dock and railway working, traffic development and the equipment, maintenance and development of dock properties.

He has on a number of occasions, on behalf of the Alexandra and Great Western Railways, visited the principal ports in this country and abroad.

He is a Newport Harbour Commissioner, a member of the Institute of Transport, of the Chambers of Commerce of Cardiff and Newport, and of the Cardiff Coal and Shipping Exchange.

Mr. Brown has been selected by Bristol out of 236 candidates for the position.

Port of Southampton Topics.

SHIPPING ACTIVITIES IN JUNE.

The June list again shows an upward movement in Southampton's shipping activities, 200 vessels using the port during the month. This is an increase of 25 over the number in the corresponding month last year, and is evidence of the growing use of the port by shipping companies. The figures include only those vessels engaged in regular service, and there are, of course, in addition, many occasional visitors dropping in with cargo or for repairs. The cross-Channel boats of the Southern Railway are also not included.

A pleasing feature of the June list is that it maintains the monthly record of new vessels being added to the Southampton services. In January the Hamburg-America liner " Magdalena " made her maiden voyage from this port, and the homeward calls of the " Bay " boats of the Aberdeen and Commonwealth Line were inaugurated. In February the " Rangitiki," the first of the three ships for the New Zealand Co.'s service, made her first sailing from Southampton, and in March another Hamburg-America liner, the " St. Louis," began her service with a trip to New York. April was made notable by the addition of the " Statendam " to the Holland-America's service to America, and the coming of the first vessel on the P. and O. Co.'s service to Calcutta, while May's contribution included the appearance of the first of the P. and O. cruising vessels.

June has been marked by the maiden sailing of the Hamburg-America liner " Milwaukee," a sister ship of the " St. Louis," and the fifth vessel added to the Southampton service of the Hamburg-America Line in the space of a few months. June has also witnessed the coming to Southampton of the first representative of the " Duchess " class of Canadian Pacific steamer by the arrival of the " Duchess of Bedford " from Montreal.

INCREASE IN OUTWARD CARGO FOR MAY.

During May there was a substantial increase in the amount of outward cargo handled at Southampton Docks. The total was 55,100 tons, an increase of over 8,000 tons on the amount for May of last year. This is one of the biggest monthly increases ever recorded. There was a slight decrease in the amount of inward cargo during the month, but the volume of outward and inward goods together showed an advance of 5,220 tons over the figures for last May, viz., 93,378 tons.

Except for this small decline in inward cargo the figures all give evidence of the healthy expansion of the port. The number of passengers and troops landed at the port in May was 21,441, compared with 18,267 in May of last year; while the number of embarkations was 20,683 against 18,871. There was thus an advance of about 1,250 a week in the number of people passing through the port, a very great advance. The number of ships dealt with during May was 630 (314 inward and 316 outward), against 592 in the corresponding month of last year, while the gross tonnage handled reached the very large total of 3,355,989, representing an advance of nearly half a million tons.

BREMEN TO CALL IN JULY.

Southampton is looking forward to seeing the new North German Lloyd 46,000 ton liner " Bremen " early in July. She is coming to the giant floating dock here in order to have her under-water portions cleaned and attended to, and she will then return to Bremen to begin her maiden voyage to New York on July 16th. After calling at Southampton on July 17th, she will reach New York on the 22nd, and make a stay of five days there. On her homeward voyage the " Bremen " will make Southampton her port of call instead of Plymouth. At present the " Stuttgart " and the " Munchen " are the only vessels of this line to make a call at Southampton eastbound, but after October all the homeward vessels will call here, with the exception of the " Dresden " and the " Karlsrube," which, before proceeding direct to Bremen, will call only at an Irish port. The North German Line's " Columbus " is shortly going into the shipyards at Bremen to have new and more powerful machinery fitted with the object of increasing her speed. She will be in the yards about six months.

A QUICK TURN-ROUND.

The United States liner " Leviathan " made a remarkably quick turn-round at Southampton on her last trip, being in dock only 36 hours before starting her voyage back to New York. Arriving at Southampton at about 10 p.m. on June 18th, she disembarked her 600 passengers and 200 tons of cargo, also a large quantity of mail, and while this was in progress took in oil fuel, cargo and stores for the return journey, so that she was able to leave port soon after 10 o'clock on the morning of the 20th. The hustle was carried out in order to allow the " Leviathan " to enter dry-dock at Boston on the completion of her voyage.

CAPTAIN KING RETIRES.

One of the most popular figures at the Port of Southampton, Captain J. King, O.B.E., R.D., R.N.R., Principal Officer of the Board of Trade for the South and South-Western District of England, of which Southampton is the centre, has retired, after holding that office for nine years, and his retirement has been marked by presentations from all the shipping companies of the port and many other shipping friends.

Captain King has completed fifty years active service with the sea. He first went to sea when he was 13 years of age and made the trip across the Atlantic in a brig-rigged steamer. He was apprenticed to the well-known firm of sailing ship owners, Messrs. Myers and Co., of Liverpool, and sailed in " windjammers " to all parts of the world. For some seven years before the Great War, Captain King was a Board of Trade examiner at Hull, Grimsby, Scarborough and Boston, and later he was on the Nautical Survey Staff in the Bristol Channel. After serving with the Navy throughout the war he was selected for duty in German waters with the Allied Naval Armistice Sub-Commission. Later he was president of the Inspection Committee in the Maritime Service of the Reparation Commission for duty in Germany in connection with the taking over of merchant tonnage due under the Peace Treaty.

Captain King is succeeded by Captain W. H. Whittle, O.B.E., R.D., R.N.R. Senior Surveyor to the sub-district of Middlesbrough.

New Canalisation Works on Lower Main.

The following is the summary of an article contributed to the " Frankfurter Zeitung " on the subject of the Main Canalization Works:—

The preparatory work in connection with the new canalization works was practically concluded in 1928. The work was expected to take about two years and to be begun in 1929. The material and labour required for the Griesheim weir were called for by the Official Neubauamt in January of this year, though the supplementary credits had not yet been bestowed. Meanwhile, the negotiations between the Wasserbauverwaltung and the city of Frankfort in regard to taking over the additional cost necessitated by the widening of the locks (Schleusenkammern) from 12 to 15 metres are so far advanced as to enable a draft of the necessary agreements to be made. There should, therefore, be nothing to hinder the carrying out of the whole programme of constructive work.

The total cost of the work was estimated in 1925, and according to prices then ruling, at 28 mill. R.M. The increased cost owing to the rise in prices which occurred up to the middle of July, 1928, is estimated at 5 mill. R.M. Added to this is the cost of the second lock gate at each of the two new weirs, viz., at Griesheim and Eddersheim, making a grand total of 37 mill. R.M. In distributing the total construction costs to be incurred on the fairway and in the power stations connected with the scheme it was proposed that the latter should be financed by means of loans. According to the latest negotiations with those interested in consumption of the current it may be anticipated that the construction of the power stations will be rendered possible by means of private capital. Public money has nothing to say in this connection, and consequently the 9 mill. R.M. required for the power stations can be deducted from the total of 37 mill., bringing it down to 28 mill.

So far the sums granted by the Reich amount to 100,000 R.M. in 1926, 3 mill. in 1927, and 3 mill. in 1928, making a total of 6.1 mill. It was thought that the amount granted for 1929 would amount to 4 mill. R.M., but information has just arrived that, in accordance with the mutual agreement of the Reichstag fractions, the amount voted for the work on the Lower Main for 1929 will only be 2 mill. This may seriously hold up the work, unless, after all, the " cut " proves less considerable, and this can scarcely be anticipated.

MORE GRAIN HANDLING EQUIPMENT FOR VANCOUVER.

The Alberta Wheat Pool is stated to be contemplating the enlargement of its grain elevator at Vancouver, the increased capacity being 2,750,000 bushels, bringing the total up to 5,150,000 bushels, at a profitable cost of $2,750,000. No definite decision has yet been announced by the Board of Directors.

Tenders are also being called by Midland Pacific Terminal, Ltd., in connection with the possible erection of a million bushel addition to its elevator on the north shore of Burrard Inlet. This would cost about $1,000,000, giving the plant a total capacity of 1,500,000 bushels.

The two projects, if completed, would bring the port's total grain storage capacity up to 14,150,000 bushels. In addition to these proposals it is to be noted that the Vancouver Harbour Commission contemplates building additions aggregating 7,500,000 bushels to its No. 1, No. 2 and No. 3 elevators, provision of $3,000,000 for these extensions being made in the estimates now before Parliament at Ottawa in connection with a loan of $10,000,000 to the Board of Harbour Commissioners for improvement of terminal facilities at Vancouver.

Harbour Engineering Notes.

DEVELOPMENTS IN PHOTO-ELECTRIC CELLS.

Recent developments announced by the research laboratories of the General Electric Co., Ltd., in photo-electric cells should do much to widen the industrial applications of that interesting device. Until this development the practical uses of the photo-electric principle were somewhat limited, but with the evolution of the " photo-cell " the operation of industrial and commercial mechanisms which depend upon light-sensitivity should be greatly simplified. Such mechanisms include talking pictures, picture telegraphy, the sounding of alarms through the interruption of a beam of light, and the detection of smoke or dust particles in the air, and the indication of colours.

The standard Osram photo-cell has a cathode of potassium sensitised by the discharge in hydrogen and is filled with argon. The cathode is a layer deposited on the silver coating on the bottom of the cell, and the anode is the ring, covered with gauze, parallel to it. Potassium is the cathode most suitable for any light that is roughly white, that is to say, light from sources used for general illumination, such as the sun or incandescent lamps. The purpose of the argon filling is to magnify the primary photo-electric current, which consists of a stream of electrons emitted from the cathode when light falls on it. These electrons travel through the gas under the attraction of the positive potential on the anode, ionise the molecules of the gas and set free other electrons which are added to the primary stream. The amount of this magnification depends greatly upon the voltage applied between cathode and anode.

BOREHOLES AS A SOURCE OF CHEAP WATER SUPPLY.

A large number of public water supply companies and industrial firms are drawing their water supplies from boreholes, in consequence of the constantly increasing use of subsoil water, the centrifugal borehole pump has found a large field of application for raising water from boreholes sunk to depths as much as 500-ft. below surface.

To suit the special conditions of working with boreholes, a type of pump has been evolved, with the driving motor installed at ground level, while the pump itself hangs freely in the borehole on the pipe which serves as a rising main. In designing this pump particular attention was paid to obtaining a pump of extremely small diameter in order that it could be employed in correspondingly narrow boreholes.

A comparison between an ordinary pumping plant and a centrifugal borehole pump shows clearly the advantages of the latter, both with regard to the simplicity of foundations and of the plant as a whole, and also because of the ease with which it can be attended. The whole pump structure is independent of the well, and any slight displacement of the ground, such as often experienced, cannot harm the pump. This arrangement further permits the whole of the machinery to be withdrawn from the well in a short space of time, there being no obstructions such as girders and bearings to be contended with.

An important point to be taken into consideration when erecting a borehole pump is the amount by which the water level varies in the borehole. In many cases this is considerable, being due on the one hand to variations of the horizon of the subsoil stream depending upon the weather and, on the other hand, to a cone-shaped depression being formed in the subsoil water horizon while the pump is working, in consequence of the reduction in the pressure against which the water has to flow on approaching the borehole. In any particular soil, the amount the water level falls will increase in accordance with the increase in the amount of water pumped, and inversely as the diameter of the borehole. The amount of this fall in level, which can only be determined by actual trial, varies considerably in one place to another.

The pump must be installed low enough to ensure its being under water when starting, since this is effected without priming. A second condition, which generally determines the depth at which the pump should be fixed, is that the water level during pumping, after the depression in the subsoil horizon has become stationary, should not be more than 16 to 20-ft. below the pump. In order that a pump may work satisfactorily, the suction head, i.e., the height of the pump above the water level, should not exceed about 20-ft. A borehole pump must therefore fulfil the two conditions of having a small diameter and being able to work when submerged.

The pumps are either of the single or multistage type, according to the prevailing working conditions and they work on the same principle as ordinary centrifugal pumps. Frequently, not only is the pressure head sub-divided by pump stages working in series, but the quantity of water is also split up by arranging the impellers to run in parallel, with a view to reducing the external diameter of the pump. The vertical shaft connecting pump and motor is guided in bearings arranged within the rising main.

The shaft of the modern borehole pump runs in lignum vitæ bearings, the water delivered by the pump serving as lubricant. The bearings consequently require no special lubrication and the water pumped remains absolutely free from any impurities such as would be caused by the presence of lubricating oil. A check valve is fitted at the lower end of the pump, so that the rising main and pump casing remain constantly full of water and the bearings are certain of being lubricated immediately the pump starts.

The shaft and rising main are divided into several equally long sections (about 8-ft. in length) according to the depth of the borehole and connected by coupling sleeves having a taper fit and designed to cause the least possible obstruction to the flow of water. The shaft is also protected by easily renewable bronze sleeves where it passes through the bearings. The sections of the rising main are joined with accurately machined and centred flanges. (For boreholes of small diameter, Sulzer Bros. have built a special type of borehole pump, in which, in order to reduce the diameter as much as possible, the pipes constituting the rising main are not connected by means of flanges but by screwed sleeves.)

The bearing supporting the shaft is fitted with forced lubrication and lies outside the rising main.

Although compactness in design and extreme reliability are leading features of the borehole pump, careful attention has also been given to the question of high efficiency. The borehole pump described is suitable for almost any type of drive. Where cheap current is available, the simplest no doubt is by means of an electric motor; in many cases, however, bevel gear drive through a Diesel engine is the most economical method, the fuel consumption being extremely low, amounting to not more than 0.4 to 0.48 lb. per b.h.p. hour, or when conditions are favourable steam engine drive can be employed.

With such plants the cost of raising 1,000 gallons of water 100-ft. will be about ¾d., including all overhead charges, while similar economies can be obtained with electrical drive depending upon the cost of the current.

LIQUID BATHS FOR THE HEAT TREATMENT OF STEEL.

It is often of vital importance that steel be heat treated without alteration of surface composition. Heat treament is also employed to produce a thin skin or surface hardening effect. In either case it is usually necessary to preserve the surface appearance of the work. Liquid heating mediums, if properly selected and operated, can usually fulfil these requirements with a more uniform degree of heating than other methods. This in its turn reduces troubles due to warping and cracking and results in an increased volume of production and a greater uniformity of product. The various liquid heating mediums employed in the treatment of steel fall into three general classes—metals, salts, and, to a minor degree, oils. Lead is the only metal which can be considered from a commercial point of view. Numerous salts are available, but the mixing of these salts to obtain the desired results requires considerable knowledge and experience, and calls for a specialist on the subject. Oils are sometimes used for tempering at low temperatures, and are specially compounded to give them the desired properties.

Lead is readily oxidised by the air at all temperatures when molten, and must be protected by a suitable covering to prevent excessive formation of dross. This oxidation is very troublesome, and results in loss of lead and dirty work. These oxidation products and other impurities getting into lead cause it to adhere to the stock and to attack the stock and the container. The high specific gravity of lead causes the work to float on the surface of the bath, and unless kept immersed by suitable fixtures, uneven heating will result. If fully immersed, the work is protected against oxidation during heating, but on withdrawal is immediately oxidised by exposure to the air. These and other difficulties are overcome by the salt bath process, and it is now possible to obtain salts for use at all temperatures from 150 deg. C. to 950 deg. C., which are guaranteed to give satisfactory results when operated according to instructions.

It is with the object of demonstrating the usefulness and ease of control obtained with these products that a demonstration plant has been installed in the Industrial Appliances Workshop and Showroom of the Gas Light and Coke Co., at Goswell Road, E.C.1. The complete equipment necessary for salt bath hardening, tempering and surface hardening has in this way been placed at the disposal of those interested so that they may prove for themselves the advantages of scientific heat treatment and have an opportunity of seeing their own work pass through these modern processes. The salts used in this plant are Houghtons heat treating salts.

Three types of salts are in use: (1) Surface hardening blocks. This product is for use where surface hardening is required, and, when heated in a container, it can be used in its molten condition between temperatures of 700 deg. C. and 900 deg. C. The temperature and time of immersion are very important factors in this treatment, but, with the correct equipment, uniformly satisfactory results are practically certain. (2) Liquid heat. This salt is a heating medium for steel, and is used

in its molten condition between temperatures of 650 deg. C. and 900 deg. C. It permits of a better control of the hardening temperature, assuring a fine, compact grain. It produces bright, clean work entirely free from scale. (3) Draw temp. For tempering above 150 deg. C., liquid salt baths should be used. Draw temp. is a tempering salt which, at working temperatures, is a thin, freely circulating liquid giving uniform temper and cleanliness of surface.

Pyrometers and thermometers employed in salt baths must not only be exceedingly accurate as temperature measuring instruments, but they must be simple in design and very robust. Such pyrometers are supplied by Siemens Brothers and Co., Ltd., of London, and are fitted to this demonstration plant. They are of the thermo-electric type and are constructed in such a way that the heat and furnace gases cannot affect any of the more delicate parts of the indicators or thermo-couples. When constant heating does eventually destroy the pyrometer protecting sheath, its replacement by a new one is inexpensive and can be effected very quickly by the furnace operator.

A properly designed furnace will not in itself ensure maximum production at lowest cost. Often incorrect design will mean a complete failure of a heat treating process employing liquid baths. In such cases the liquid bath process is usually blamed for the failure, whereas it is generally a matter of furnace design and operation. A test of a liquid bath is not a fair test unless the furnace used is properly designed and operated. The pot or container used for the salt should be considered as a part of the furnace, and here again care should be taken that it is correctly designed, made of suitable material and is properly installed. There are many points in liquid bath design which must be taken into very careful consideration if satisfactory working is to be obtained, and examination of these furnaces will show that great care has been taken to make them highly efficient and inexpensive to maintain.

An enumeration of a few of the difficulties encountered in salt bath furnaces are: (1) Furnaces should have large heat storage capacity and be well insulated, so that temperature fluctuations can be kept at a minimum. (2) The heating chamber should be large enough to allow the hot gases to surround the container completely and uniformly without direct flame impingement and to allow time for those gases to give their heat up to the container before they pass out of the exhaust flue. (3) The cross section of the molten bath should be as small as possible so as to expose the maximum surface of the container to the heating chamber. (4) The furnace should be provided with a bottom drain so that salt may be drained out in case of failure of the container. (5) Means should be provided for accurate control of fuel to air mixtures so as to effect accurate control of the atmosphere in the heating chamber and prolong the life of the container. (6) The material used for containers must be suitable for the salt used and for the temperature of operation.

As far as the majority of the above requirements are concerned, it is simpler to design a furnace for gaseous fuel than for liquid fuel. But when the salt bath method of heat treating is being considered it is sometimes necessary that a liquid fuel be used.

For gas fuel the question of burner tunnels, combustion space, heating space, location of burners, flame impingement on containers, etc., are much more easily handled than with oil fuel.

The rapid advance in heat treatment methods during the past ten years has had the result that those interested in the sale of the equipment are called upon to render a considerable amount of technical advice and assistance. It is mainly due to the keen enterprise of such undertakings as the Gas Light and Coke Co. that this development has been so rapid.

The Port of New Orleans.

MAY SHIPPING AT NEW ORLEANS.

Deep-sea vessels arriving at New Orleans in May, 1929, amounted to 275 vessels of 1,081,715 gross tons register, an increase of 124,185 gross tons over the record for May of 1928, according to the monthly compilation of the Board of Commissioners of the Port of New Orleans. These figures do not include vessels arriving at landings on the river above or below the port limits administered by the Board. There were 278 departures in deep-sea trades during the month.

Similar increases were shown in respect to cargo movement in ocean vessels, in the movement of inland watercraft, and in the business of the inner harbour navigation canal. Over the public wharves, owned and operated by the Board, 417,614 tons of merchandise were loaded and discharged, a comparative increase of 21,424 tons, which does not take into account the oil, molasses, bulk ores, sugar and various other commodities which were received or shipped at privately owned terminals. The Board's banana conveyors handled 2,403,550 bunches of bananas.

The distribution of deep-sea arrivals by flag and gross tonnage for the month was as follows:—

Flag.	No. of Vessels.	Gross Tonnage.
American	162	700,933
British	15	71,251
Brazilian	2	9,041
Belgian	2	12,083
Danish	7	20,008
Dutch	3	19,116
French	1	8,590
German	6	20,732
Honduran	32	81,490
Italian	3	16,939
Japanese	1	7,267
Norwegian	32	93,877
Nicaraguan	4	6,276
Panaman	1	668
Swedish	4	13,444
Total ...	275	1,081,715

THE RIVER MOVEMENT.

The arrivals of inland watercraft of more than 25 tons measurement on the Mississippi River in May amounted to 282 vessels of 114,682 tons, an increase of 18 vessels and of 20,149 tons as compared with the same month of the previous year. The increase was in the number of Mississippi-Warrior Service vessels and river steamboats, there having been arrivals of 106 Mississippi-Warrior vessels of 75,134 tons, an increase in these alone of 14 vessels and of 16,076 tons.

INNER HARBOUR NAVIGATION CANAL.

The total north and south movement in the inner harbour navigation canal consisted of 881 vessels of all classes, with an aggregate measurement of 394,711 tons, which is an increase of 58 vessels and of 63,753 tons as compared with the movement in May, 1928. This consisted, northbound, of 94 Mississippi-Warrior vessels of 46,277 tons, 21 ocean steamships of 91,907 tons, 316 miscellaneous vessels of 53,608 tons; southbound, of 96 Mississippi-Warrior vessels of 47,598 tons, 22 ocean steamships of 99,633 tons, and 332 miscellaneous vessels of 55,688 tons.

ANOTHER POST FOR SIR JOSIAH STAMP.

Sir Josiah Stamp, G.B.E., D.Sc., has been invited and has agreed to accept the office of President of the Institute of Transport in succession to Air Vice-Marshal Sir Sefton Brancker, K.C.B., A.F.C., whose year of office expires on September 30th next.

PORT OF BRATISLAVA.

It has been finally decided to extend the port of Bratislava. The Ministry of Public Works has requested the Municipality for an area covering 42 acres near the Danube, of which only 36 acres are municipal property, the rest to be gradually purchased over a number of years. The Ministry intends first to construct a channel for the petroleum and benzine harbour, later on a separate military harbour, and eventually a general harbour to serve the whole country. The administration of these harbours will be carried out by the Ministry of Public Works. In addition a contract has been entered into for the construction of a channel for industrial purposes, in respect of which the Municipality will have to provide the necessary roads and railways, towards the expense of which they will in the meantime receive a subvention of 90—95 per cent. from the Road Fund.

BIG U.S. SHIPPING MERGER PLAN.

A proposal to merge seventeen steamship companies operating on the Great Lakes into one big concern with combined capital of $40,000,000 (£8,000,000) to $50,000,000 (£10,000,000) was announced in New York on 18th June, 1929, by Messrs. Otis and Co., the Cleveland and New York bankers, who have made a definite offer to the owners.

Should the scheme be carried into effect, a fleet of 115 freighters with a capacity of 1,000,000 deadweight tons—equal in size to that operated by the United States Steel Corporation through the Pittsburgh Steamship Co.—would be operated by the merger company, which would buy outright and control all properties.

The chief cargoes of the Great Lakes shipping companies are iron ore, grain and fluxing stone. The consolidation has been under consideration for several years, but the offer made by Otis and Co. constitutes the first definite plan to be put forward.

This transaction, if completed, will be the latest of several big deals which Mr. Cyrus S. Eaton, the Canadian-born head of the Otis banking interests, has carried through during the last twelve months. At the end of last year he was responsible for the dramatic coup which left him and his associated interests in control of the great Goodyear Tyre and Rubber Co., the biggest factor in the world's rubber industry. More recently he arranged the merger between the £20,000,000 Cleveland-Cliffs Iron Co., the largest iron ore concern in the United States, and the Eaton interests, controlling the most important U.S. group of independent steel companies.

Affairs of the Humber Ports.

A speedy and favourable reply has been received by the Hull Chamber of Commerce to their representations regarding the improvement of dock and other facilities at Hull.

Sir Ralph Wedgewood, Chief General Manager of the London and North-Eastern Railway Company, in his letter wrote: "We are at the present time giving careful consideration to the character of the works to be undertaken as a result of the remission of the Passenger Tax, and I can assure you that the claims of Hull, as the principal port served by the L. and N.E.R. and the site of our most important dock undertaking, will receive the fullest consideration."

The president (Sir Arthur J. Atkinson, J.P.) welcomed the announcement most cordially.

The arrival of a Booth Line steamer at Hull with Brazilian produce has encouraged the hope that it will be possible to establish a regular service between Brazil and Hull, and with this object in view the Lord Mayor and others interested in Hull trade have had an interview with the directors of the Booth Line at Liverpool.

The decision of the Hull Corporation to purchase a large area of land to the east of Hull, formerly the Hedon Race Course, for the purposes of a municipal aerodrome has been received in commercial circles with great satisfaction. At the meeting of the Chamber of Commerce the president remarked that it was the first step in the movement for the establishment of Hull as an air port: they did not want to be behind other cities in the matter of airways. Efforts were, he added, now being made to secure also a seaplane base on the Humber.

The Humber Conservancy Board have decided against taking part in the Conference proposed by the Hull Corporation on the question of the promotion of a scheme for providing rail and road transport facilities by means of a bridge or tunnel between the East Yorkshire and the North Lincolnshire banks of the River Humber from a point west of Hull. The Works Committee of the Conservancy reported that they felt that the nature of the constitution of the Conservancy Board and its powers and duties were such that they could have no concern in the promotion of such a scheme. If a scheme were put forward it would require exhaustive examination and investigation on the part of the Board, as the authority charged with the protection of interests of paramount importance, viz., those of navigation. In these circumstances the committee could not recommend the Board to avail themselves of the invitation to appoint representatives to the proposed Conference.

The chairman (Mr. J. H. Fisher, J.P.), replying to Mr. Rushforth (Grimsby) said that the Conservancy Board were in a judicial position, and that if a scheme were evolved they could not tie their hands by participation in its preparation. Mr. Rushforth ventured the remark that a scheme would not get much support unless the bridge or tunnel started from a point eastward and not westward of Hull.

The export coal trade of the Humber ports continues to expand largely owing to the operation of the Yorkshire and Midlands Coal Marketing scheme and the fact that foreign competition is not quite so keen. In May the exports of coal from the Humber to places abroad were 522,798 tons against 247,242 tons in May last year, and for the five months to date were 2,260,133 tons against 1,049,008 tons, an increase of 1,211,125 tons, equal to 115 per cent. In addition, the exports from Boston, etc., amounted in May to 43,571 tons, and for the five months to 178,270 tons. The above figures are, of course, exclusive of bunker shipment, which average 200,000 tons per month. A feature has been the exports of coal to Australia and New Zealand. The great bulk, however, is sent to Europe and South America.

One of the matters which go towards determining whether a port is "cheap" or otherwise is that concerned with pilotage charges. This is being very keenly discussed at Hull, where applications have been made by the Humber pilots for higher remuneration. Shipowners have taken strong exception to the statements issued on behalf of the pilots, and it was shown by Mr. W. Minnit Good at the monthly meeting of the Humber Conservancy that they enjoyed, in addition to liberal fees, considerable advantages in regard to sick leave (twelve months on full pay), pensions (beginning at 50s. a week after 25 years' service), provision for incapacitation, and benefits to widows and orphans. The pension fund now stands at £36,000, and the 7 per cent. contribution paid by the shipowner through the pilotage rates, together with the income from investments, leaves, after all payments have been made, an annual surplus of about £2,000 for investment. Up to recently half the annual surplus was distributed among the pilots by way of bonus. In these circumstances the shipowners consider that their 7 per cent. contribution is too high and should be reduced two or three points and the proceeds devoted to some other purpose.

The inadequacy of quayside facilities and inefficient appliances at the docks at Goole have been brought to the notice of the London Midland and Scottish Railway Company by the local Chamber of Commerce. In reply, a letter has been received from the railway company stating the question has been under consideration some time and that a scheme has been formulated for the development of the north side of the West Dock by the provision of a shed, together with the requisite cranage and sidings accommodation. It was added that the scheme necessarily involves the expenditure of a large sum of money, and that the matter is prominently under notice, and the object of placing the facts before the directors of the company as early as possible. A reply has also been received by the Goole Chamber of Commerce from the Aire and Calder Navigation, in which Sir John Eaglesome stated that his Board were in correspondence with the L.M.S. Company in regard to the development of the northern side of the West Dock and that the layout and general plans had been agreed to by the engineers of the Aire and Calder Navigation and the railway company.

Launch of H.M.S. "Poseidon."

Mrs. Haggard, the wife of Vice-Admiral V. H. S. Haggard, C.B., C.M.G., a Lord Commissioner of the Admiralty, launched H.M. Submarine "Poseidon" at the Naval Construction Works of Messrs. Vickers-Armstrongs, Ltd., at Barrow-in-Furness on 21st June. The launch was of a quiet nature, but Mrs. Haggard was supported on the launching platform by Admiral Haggard, many of the British and foreign officers stationed in the town, and by Commander C. W. Craven, the managing director of the Barrow Works, with the principal members of his staff.

It is singularly fitting that Admiral Haggard's wife should have undertaken the duty of launching this vessel, as, before his transfer to the Admiralty, he was Admiral of Submarines, and he did his share in building up the undoubted efficiency of this essential part of the British Navy.

The "Poseidon" is the second of the "P" Class and the 154th submarine to be launched from the Barrow yard. Further "P" Class submarines will be launched in July and August respectively. There will then be three "R" Class boats on the stocks. With the "Poseidon" there are now four submarines in various stages completing at the fitting-out dock.

The facility with which this famous submarine-building firm can turn out these vessels is now well known, but it may not be equally recognised that it is due to an organisation of designers, workmen and equipment started in the very earliest days of submarines and maintained with increasing efficiency since then, often in very difficult times when submarine orders have been very few and far between. This organisation proved its great worth during the Great War, and until the millennium arrives when nations require no navies to protect their shores, it must be regarded, in the words of a former First Lord of the Admiralty when referring to the Barrow works as a whole, as "a great national asset."

COAL TRAFFIC IN RHINE-RUHR HARBOURS (FOREIGN DESTINATION).

The following quantities of coal passed the Rhine-Ruhr harbours in 1928 on their way to foreign countries:—

To Italy, 604,802 tons; France, 308,839 tons; Holland, 9,423,839 tons; Belgium, 1,914,577 tons.

RATIONALISATION OF RHENISH HARBOURS.

Several Rhenish industrials and unions' leaders, together with University Professor Kuske, of Cologne, have formed a commission for the preparation of rationalisation of the Rhine harbours. The harbour question will be fully examined, for profitableness of Rhine shipping suffers from the existence of a great number of small harbours on the Rhine. The commission has commenced working and will visit all the towns concerned.

PETROL-ELECTRIC MOBILE CRANES.

A catalogue describing the petrol-electric mobile cranes has just been issued by Messrs. Ransomes and Rapier, Ltd., of Ipswich, and also of 32, Victoria Street, London.

The catalogue very fully describes the various uses to which these cranes can be applied. The illustrations show the cranes being used in industrial work, railway work, dock work and various other works. A copy can be had on application to Messrs. Ransomes and Rapier, Ltd., as above.

THE MARCONI INTERNATIONAL MARINE COMMUNICATION COMPANY, LTD.

The Marconi International Marine Communication Company, Ltd., announces that Major Basil Binyon, O.B.E., has been appointed a director of that company, and that the following re-arrangement of duties of its higher officials will be effective from July 1st:—

Mr. J. Lewis, Personal Assistant to Mr. F. S. Hayburn, Deputy Managing Director; Messrs. A. R. Harding and R. Ferguson, Joint General Managers; Mr. J. A. Carswell, General Manager for the North; Commander J. A. Slee, Manager, Marine Electrical Equipments; Mr. Wm. Platt, Manager, B.W.M.S. (vice Mr. R. Ferguson); Mr. J. Connell, Deputy Manager, B.W.M.S.; Mr. B. Newton, Contract Manager (vice Mr. A. R. Harding).

Mackay Harbour Board.

Chairman's Annual Report for 1928.

The chairman's (John M. Mulherin) annual report for the Board Year, which ended on the 31st March, 1929, is as follows:—

The financial year closed on the 31st December, 1928; and the Statement of Accounts connected therewith were duly audited by the Local Auditor; passed by the Auditor General; allowed at the last monthly meeting; and certified in accordance with the resolution under the Harbour Boards Act.

PERSONNEL OF THE BOARD.

Messrs. G. E. Heidke, J. A. Love, and J. M. Mulherin represent the City of Mackay; Messrs. J. M. Gibson, R. Kippen, and T. G. Mulherin represent the Shire of Pioneer; Mr. H. Atherton represents the Shire of Sarina; Mr. J. W. Madill represents the Shire of Mirani; and Mr. P. W. Petersen represents the Shire of Nebo.

MEETINGS.

During the Board Year there were one Annual, 14 Monthly (two adjournments being included in favour of the members who were present), four Special, and 17 Committee Meetings; or 36 meetings in all.

REVENUE.

The total amount of revenue received for the financial year ended on the 31st December, 1928, was £17,183 14s. 9d., of which the sum of £16,419 11s. 8d. was collected for harbour dues. Such an amount for harbour dues only, establishes a record for Mackay.

SHIPPING.

The arrival of vessels in the port during the year 1928 numbered 190 with a registered tonnage of 468,651, as compared with 178 and 477,895 respectively in 1927.

The departures numbered 189 with a registered tonnage of 473,346 as compared with 177 and 472,970 respectively in 1927.

WORKS.

No works of any considerable magnitude were undertaken during the year, though an optimistic hope existed among the members of the Board that the construction of an Outer Harbour with have been commenced ere now.

Good work has been accomplished in the erection of the mooring piles near the mouth of the river to facilitate (principally) the despatch of the large sugar exportations by the Adelaide Steamship Company, to whom the piles have been leased. The Board's offices, boatshed at the landing, and quarry buildings have all been repainted and put in good order; and the engines and machinery at the quarry have received careful attention and repairs under the direction of the Government Inspector of Machinery. The required revetment of the river bank in front of the offices was duly carried out; the removal of rails and sleepers from the North Wall was effected; the lifting of the rails from the road-crossing on the line to Mount Bassett was done (thereby saving a heavy premium on a Public Risk Insurance Policy); and the general maintenance of the Board's valuable plant had the active supervision of the Acting Engineer and Overseer of Works. At the present time considerable work is in progress so far as the Queen's Wharf and Bond Wharf premises and understructures are concerned.

RIVER.

The river is still a continual source of annoyance and inconvenience to the shipping interests on account of the shifting beds of sand therein; and particularly is this the case at the river's mouth where the bars are ever on the move, and altering the channels. Recurring floods in the early part of the year, and just recently, have had no good results, and it now seems to be generally acknowledged that the River Scheme under which the Director Wall in the river was erected, will never give Mackay the benefits expected from it, or assist towards affording the harbour facilities that shipping rightfully demands. Dredging has been advocated by many persons; but the Chief Engineer of the Harbours and Marine Department does not encourage the Board to adopt any policy in that direction; and evidence elicited at the Board of Inquiry in 1911 supports Mr. Cullen in his refusal to recommend dredging. It has been ascertained also that, to be of any use whatever, an expensive dredger would have to be permanently at work.

HARBOUR FACILITIES.

During the greater part of the year 1928, the Board vigorously followed its policy in no uncertain manner in its endeavours to obtain an Outer Harbour; and put before the Government proposals which had been most carefully planned and estimated. But its proposals were turned down. And yet it cannot be disputed that there is no good or valid reason why a harbour suitable for all vessels at any state of the tide, and in any weather cannot be made inside of Flat Top Island. The chairman ventured to base his opinion on that of Sir John Coode's, who was unquestionably one of the most eminent of the world's engineers on harbour construction. He came there in 1886, and after a searching and thorough examination of the locality and its surroundings, reported upon his work in the early part of 1887. He summed up his opinion in these words: "No doubt the time will come when the splendid natural breakwater, Flat Top Island, will be converted into a sheltered harbour such as the chairman suggested." Every engineer who has since reported upon the necessity of an Outer Harbour, has supported Sir John Coode's views.

At the desire of the Board in the second half of the last year, the Government was asked to secure the appointment of a qualified harbour engineer from among the members of the Institute of Civil Engineers to advise and report upon the provision of harbour facilities for Mackay. To this course the Government agreed; and later notified the Board of the appointment of Mr. W. E. Adams, M.I.C.E., M.I.E. (Australia). In a letter bearing date the 3rd October, 1928, the Board was informed by the Treasury that the "services of Mr. Adams have been engaged to furnish a report on the proposed scheme for providing harbour facilities for the port of Mackay." And before his arrival there he received instructions from the Government that he was to report only on the merits of the Board's Outer Harbour Scheme as planned and estimated by Mr. Joseph McDowell (formerly the Government's Resident Constructing Railway Engineer in this district). Mr. Adams met the Board at a special meeting called for that purpose, and in answer to a question, informed it that his instructions were to do nothing but report on the Board's proposals, that is to say, Mr. McDowell's work. The Board very strongly protested by wire to the Government against the services of Mr. Adams being confined to that one purpose; but without any result other than if he was required to do other things the Board must pay for the additional services together with the three hundred guineas, the fee for which he had been engaged. It will therefore be noted that the Government did not act up to the agreement upon which the appointment of a harbour engineer was asked for. Mr. Adams was there just under ten days, reported adversely regarding the concrete construction of the viaduct, and the wharves' understructure (preferring piles in both cases); and almost doubled Mr. McDowell's estimates. And there the matter ended, so far as Mr. Adams was concerned.

In January last Mr. Cullen arrived there at the request of the Board to advise upon the provision of harbour facilities for Mackay; but furnished no advice whatever in the direction sought. He was asked whether Port Newry would provide a suitable harbour for Mackay's requirements, but gave no indication of encouragement even in that direction.

Personally, the chairman held the firm opinion that Mackay's Harbour should be where the present anchorage at Flat Top is. It has, however, been decided by the Board to inspect Port Newry some time next month.

STATISTICS.

One of the most interesting and important of Mackay's statistics is that of its sugar exportations; and while the chairman much regretted the inability to obtain really reliable information respecting the large productions in the years before the season of 1901—2, he was glad to be in the position to furnish each season's output from the years just named to the season 1928—9 in the table hereunder:—

Season.	Tons.	Season.	Tons.
1901—02	24,000	1916—17	34,568
1902—03	16,000	1917—18	60,829
1903—04	18,300	1918—19	22,281
1904—05	28,000	1919—20	34,043
1905—06	32,000	1920—21	25,587
1906—07	35,000	1921—22	56,252
1907—08	42,300	1922—23	44,526
1908—09	31,200	1923—24	34,030
1909—10	32,200	1924—25	64,485
1910—11	51,900	1925—26	86,894
1911—12	41,250	1926—27	67,769
1912—13	20,650	1927—28	97,741
1913—14	54,900	1928—29	104,112
1914—15	43,000		
1915—16	29,650	Total	1,233,407

Glasgow Telegraphic Address— "Livadia Glasgow." Telephone— 3743-4-5 Douglas.

BROWNLIE & MURRAY, LTD. STRUCTURAL ENGINEERS. POSSILPARK, GLASGOW. London—59/60, Gracechurch St., E.C.3.

London Telegraphic Address— "Sequence (Bilgate) London." Telephone— 3464 Royal.

An Experiment on Corrosion and Waterflow.

An interesting experiment on corrosion was shown before members of the Institution of Civil Engineers recently, and demonstrated the action on steel of water at different velocities. A simple apparatus maintained a flow of water on to the centre of a circular steel plate about 10-in. in diameter, which rested on a platform over a tank. The plate was placed horizontally, and over its centre was mounted a pipe with a stop valve and a ½-in. diameter nozzle, which delivered a jet of water perpendicular to the plate, the nozzle being about 1-in. from the plate.

The stream of water issuing from this nozzle completely covered the surface of the plate and formed a circular wave of a diameter between 4 and 5-in. The flow of water over the plate's surface inside this wave was radial, and small bubbles could be seen moving radially from the jet centre to the wave. On the other side of the wave, that is, between the wave at the edge of the plate, the water was much deeper and of a much slower velocity; also, the small oxygen bubbles were not swept radially to the edge, but remained stationary on the plate's surface. After a time it was seen that around these bubbles oxide was forming, and eventually the plate's surface outside the wave circle was found to be corroded, while inside the wave circle the surface was still quite bright. After the experiment had been in progress for some hours, the plate was removed and wiped; the portion which had been in contact with the water inside the wave was quite bright, while the portion which had been in contact with the water outside the wave was etched by the small oxygen bubbles.

Another plate was shown which had been used in a similar experiment for a period of 170 hours. Half this plate had been brushed to remove the oxide from the surface, and there was a distinct line of demarcation between the smooth inner circumferential area and the corroded outside area.

The object of the experiment was to demonstrate that water passing through the tubes of an economiser with a high velocity and having what is termed "turbulent flow," will brush off any small bubbles of oxygen, which would otherwise adhere to the inside surface of the metal tubes and cause internal corrosion; while water passing through the tubes at a low velocity will not be able to brush off the bubbles, and therefore corrosion will take place. The point between the two velocities is called the "critical velocity," and in the case of this experiment was indicated by the wave. A similar experiment was originally made to determine what velocity should be used through the tubes of the Foster economiser, in order to prevent internal corrosion.

THE RUSTON No. 4 EXCAVATOR.

Messrs. Ruston and Hornsby, Ltd., Lincoln, England, have just issued a catalogue of their No. 4 Excavator.

The catalogue is very well produced and profusely illustrated. This excavator is made in five different types, viz.: shovel, dragline, trencher, skimmer, and grab, which, in brief, means a type for every job.

The catalogue itself fully describes the various uses to which these different types can be applied, and copies of same can be had on application to Messrs. Ruston and Hornsby, Ltd.

PORT OF LONDON AUTHORITY.

The advantage to the Port of London which has resulted from the execution of an extensive dredging programme during recent years is generally known, but the significance to shipping and trade of the broad, deep channel which extends from the Estuary right up to the entrance to the King George V. Dock, 40 miles within the Port limits, is not always fully appreciated.

There is a point, therefore, in the fact that quite recently the Federal liner, "Northumberland," a swin-screw vessel of 11,555 tons gross (550-ft. by 63-ft. by 32-ft.), drawing 28-ft. 4-in., was docked at the King George V. Dock *three hours after high water.* This performance should dispel any impression that ebb-tide docking of large vessels is not a feature of the Port of London, and also shows what may be achieved with skilful pilots and docking staff.

* * * *

A new record in the history of the Port of London is disclosed by the Board of Trade statistics just published. During 1928, 55,424,000 net registered tons of shipping used the Port of London or 16.3 per cent. of the total for all United Kingdom ports, which was 330,855,000 net registered tons. The United Kingdom figure is an increase of 9,312,000 net registered tons over 1927, and London's figures an increase of 2,847,000 net registered tons.

More recent figures also show that during the twelve months ended March 31st, 1929, more shipping used the docks of the Port Authority than during any similar period previously.

Sterilisation of Cooling Water.

An Interesting New Publication.

One of the most striking developments in the wide field of water engineering is undoubtedly the sterilisation of cooling water for steam turbines to prevent organic growths on the condenser tubes, thus enabling the full vacuum to be obtained continuously. Highly interesting also in connection with dock and harbour work is that the same principle is available for eliminating shell-fish, such as mussels, in cooling water pipes when using sea water or brackish water.

In this connection noteworthy is a fifth and much enlarged edition of the book "Water Sterilisation by Gaseous Chlorine" that has been issued by the Paterson Engineering Co., Ltd., of London. There is given a comprehensible description with numerous illustrations and diagrams of the whole principle of the use of chlorine gas, not only for the sterilisation of cooling water but also town's water, swimming baths, sewage and sewage effluents, and many other sections of the subject.

The firm are, of course, well known in the field of water purification, and they introduced the "Chloronome" apparatus (Chlorine Dispenser) in 1917. This is coupled to cylinders of liquid chlorine, and supplies, continuously and automatically, any desired amount of chlorine to bulk volumes of water, generally about one part to two or three million, while allowing of extremely accurate regulation by means of a single valve.

We understand that towards the end of 1927 more than 1,800,000,000 gallons of water were being treated every 24 hours throughout the world by the "Chloronome," and the beneficial action as regards steam engines and turbines in the way of elimination of organic growths on the condenser tubes, is to ensure the maximum cooling effect and therefore the highest vacuum in the turbines.

The chief value of sterilisation by means of 100 per cent. chlorine gas is that the latter Is absolutely stable under all conditions of temperature, allowing a very accurate regulation. The great value of the method also as regards towns water supply has been repeatedly emphasised by Sir Alexander Houston, Director of Water Examination to the Metropolitan Water Board, who installed the first "chloronome" plant in 1917, followed by a much larger equipment in 1919, having a capacity of 40,000,000 gallons per day for treating the New River water at Highfield. Since this time other installations by the Metropolitan Water Board have included particularly in 1925 the Walton Filtration Station, consisting of four units each with a capacity of 15,000,000 gallons of water per day.

Some of the newer developments include the admission of the chrorine gas to a relatively small amount of water which is then pumped by variable speed pumps direct to the main bulk of the water, and an ingenious automatic control apparatus is now available for the supply of the chlorine according to the varying demands for water. Many other aspects of water treatment are also dealt with in the book, and with regard to "Basex" for zero hardness water, this is ideal for make-up water for water tube boilers, and is now also being used in this connection by the Cunard Steamship Company on the "Mauretania" and other vessels.

The General Electric Company, Ltd.

Report of Directors for Year ended March 31st, 1929.

The directors were pleased to report another satisfactory year's trading. The profits for the year amounted to £1,084,077, an increase of £26,000. These results indicate that the gradual improvement referred to in last year's Report has been maintained.

During the period, the Company's works have been fully employed. The output, both at the heavy engineering works and at the telephone works, has reached a high level, and the volume of orders received has been satisfactory. The demand for general electrical commodities has shown a steady expansion, which has to some extent counteracted a tendency towards lower prices.

The volume of overseas trade has been well maintained. The branches in India and Argentine have again had a successful year's trading. Some improvement is visible in South Africa; in Australia and China, however, conditions have remained difficult.

The growth of the Company's business has called for additional accommodation for both the manufacturing and sales organisations. New high tension switchgear and transformer works have been erected at Witton, and head office has been extended by the purchase of adjoining premises.

The liquid resources of the Company show some reduction, amounting to £1,519,000, as compared with £1,780,000 last year.

The reserve has been strengthened by an allocation of £130,000.

Dock and Harbour Works Electrification.

II.—THE PROTECTION OF DIRECT CURRENT CIRCUITS.

Direct current electrification plays a large part in modern docks and harbours, and, when devising such a system it is essential to ensure that adequate protection be given to the circuits against the various contingencies that are likely to arise. In this connection the automatic reclosing circuit breaker is a device which should be studied by every harbour engineer contemplating a scheme of electrification.

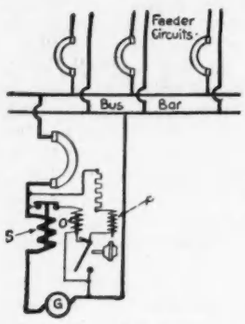


Fig. 1.

By the use of auto-reclose circuit breakers and auxiliary apparatus not only are great economies of operation made possible, but more positive protection of apparatus is secured. These breakers are applicable to the protection of both generator and feeder circuits. For the protection of feeder circuits they may be installed within the station or sub-station or their installation may be at points in the distribution system where it is desired to tie feeders together or sectionalize the system in order to localize disturbances.

With reference to their application, auto-reclose circuit breakers are broadly classified in two groups:

1. Those applied to the protection of generators.
2. Those applied to the protection of feeders.

Where a single breaker is used for the protection of both feeder and generator, as would be the case in a station having a single generator unit and a single outgoing feeder, the breaker becomes a combination of these two classifications, and it is designated as a feeder-generator breaker.

A generator circuit may be defined, for the purpose of this article, as the circuit between the generator and the station bus. Wherever there are one or more generators in a station or more than one outgoing feeder, there is a station bus. Consequently, wherever there is a station bus there are one or more generator circuits requiring one or more auto-reclose generator circuit breakers.

Fig. 1 (Igranic Electric Co.) shows an elementary diagram of circuits of an auto-reclose circuit breaker used as a generator breaker. The generator breaker is used between generator and station bus, and it is assumed that all outgoing feeders from bus are properly protected by auto-reclose feeder breakers, which are governed in reclosing by load conditions.

The operating characteristics of the generator breaker are:

(a) Breaker is closed by means of an electro-magnet.

(b) Opens automatically in case of overload or voltage failure.

(c) Remains open a definite time interval regardless of cause of opening.

(d) At the expiration of this time interval recloses automatically provided the generator voltage is at the proper value for connecting the generator to the station bus.

Fig. 1 is an elementary diagram of circuits of the auto-reclose generator breaker. The construction and operating mechanism of this breaker is the same as that of the feeder breaker. In Fig. 1 S represents the series of overload coil, O the operating coil, and P the potential or controlling coil. It will be noted that the circuits for the operating and controlling coils, O and P, are connected directly across the generator. Consequently, the operation of the armature in the controlling coil depends upon the generator voltage. The position of the armature in the controlling coil is, of course, adjustable to a scale calibrated in volts. This calibration corresponds to the voltage of the generator, and when the generator voltage reaches the value indicated by the setting of the armature in the controlling coil the reclosing mechanism operates and closes the breaker, connecting the generator to the station bus.

This potential calibration insures that the generator will not be connected to the bus bar unless the potential is sufficiently high for the generator to operate satisfactorily in parallel with other generators which may be connected to the same bus. Any number of generators may be connected in parallel to the same bus bar with this same arrangement of circuit breakers.

The overload and time interval adjustments on the generator breaker are identical with those on the feeder breaker.

The reclosing adjustment of the generator breaker is similar to that of the feed breaker. The reclosing adjustment on the generator breaker, however, is set at the value of voltage at which it is desired to connect the generator to the station bus, which is ordinarily a considerably higher value than the adjustment which is desirable on the feeder breaker.

It is important to note that when auto-reclose generator breakers are used all outgoing feeders should be protected with auto-reclose feeder breakers provided with overload and reclosing adjustments, so that in case of a severe short-circuit on the system, which would cause all breakers to open, the generator breaker or breakers may be set to reclose at the expiration of a short time interval, say, five or ten seconds, and all breakers on outgoing feeders set to have a longer time interval, so that when the bus bar is energized by the reclosing of the generator breaker or breakers each feeder breaker will close at the expiration of the time interval set for it, provided no short-circuit exists. In this way, the load will be picked up at different intervals on the outgoing feeders, and all breakers will reclose, except the one on the circuit where the overload conditions exist. This arrangement of breakers provides a maximum of protection to equipment and insures minimum delays in case of overloads and short-circuits.

Fig. 1 shows the most elementary arrangement of circuits for the generator breaker. Fig. 2 gives the diagram of circuits of an auto-reclose generator breaker protecting a rotary converter and employing a number of auxiliary safety or protective devices, the operation of any one of which will cause the a.c. switch and the auto-reclose generator breaker to open and remain open permanently. This same principle can be extended to provide protection against almost any contingency for which it is desired to obtain protection. The following is a list of the more general conditions under which these breakers are made to operate in various installations:—

(a) Overload.—In case of peak loads on D.C. lines, not sufficient to operate instantaneous overload but in excess of permissible continuous load and permissible only for short intervals of time, as from one minute to five minutes, a time limit overload relay may be used in connection with the generator breaker.

(b) Thermostat Control.—Breaker and a.c. switch open and remain open when opened by thermostats in either bearings or transformer.

(c) Overspeed.—Breaker and a.c. switch remain open when opened by overspeed device on shaft of rotary converter.

(d) A.C. Overload.—Breaker and a.c. switch remain open when opened by a.c. overload.

(e) A.C. Voltage Failure.—When breaker is interlocked with a.c. switch and reverse current relay, breaker opens and remains open upon a.d. voltage failure. This enables station to be shut down from a remote point by disconnecting the a.d. power.

(f) Where Air-Blast Transformers are Used.—Breaker and a.c. switch can be made to open and remain open by the functioning of an air-pressure relay in case of failure of air-pressure in transformers.

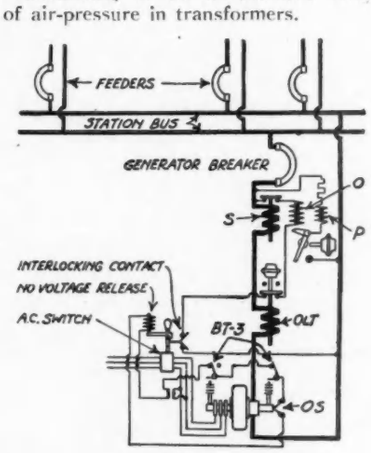


Fig. 2.

(g) Reverse Current.—Breaker may be provided with reverse current relay arranged to open the breaker permanently in case of reversal of current, or the relay may be set to reclose automatically at expiration of a short time interval provided the voltage is at or above the setting of potential coil. This latter arrangement insures the reclosure of breaker when opened by a line surge of momentary nature. The potential setting and time interval can be set high enough to prevent reclosure of breaker in case of a.c. power failure.

(h) Time Switch.—Breaker and a.c. switch may be arranged to open at a pre-determined time by means of a time switch. This arrangement can be used to advantage in semi-automatic sub-stations operating without an attendant.

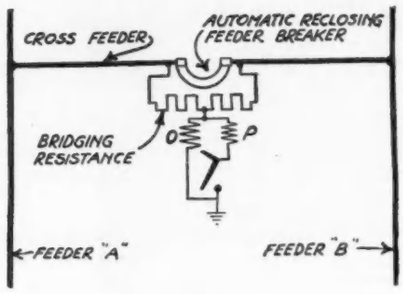


Fig. 3.

In Figure 2 the time limit overload relay is indicated by OLT. Its contacts are in the circuit of the operating coil of the breaker. Thermostat relays on the bearings are indicated by B.T.3. The contacts on these thermostat relays are in the circuit of the no-voltage release on the a.c. switch. The overspeed device indicated by OS is also connected in the circuit of the no-voltage release on the a.c. switch. The a.c. switch is shown to have auxiliary contacts connected in the operating coil circuit of the breaker, so that if the a.c. switch opens for any reason whatever, these auxiliary contacts open and the d.c. breaker opens. Obviously, when any of these protective devices operates the circuit of the no-voltage release on the a.c. switch is opened and both the a.c. switch and the d.c. breaker open.

The arrangement of auto-reclose generator breakers with auxiliary relays and protective devices, as indicated diagrammatically in Fig. 2, together with auto-reclose feeder breakers in the feeders to properly take care of d.c. load conditions, constitutes what is termed a semi-automatic sub-station. Except for starting, no attendant is required at such a station. Overloads, short-circuits, etc., are handled automatically, and in the event of abnormal conditions developing within the station, which would cause trouble if permitted to continue, and which require attention, the station shuts down automatically. Such shutting down of the station may also be accomplished at a pre-determined time by the use of a time switch.

A feeder breaker may be used anywhere in the distribution system beyond the station bus. It may be used for the protection of multiple feeders, tie feeders, and independent feeders without any modification whatever in the wiring of the breaker or method of connecting it in circuit. Fig. 1 is an elementary diagram of the auto reclose feeder breaker.

The operating characteristics of the feeder breaker are:—

(a) Breaker is closed by means of an electro-magnet.

(b) Opens automatically in case of overload or voltage failure.

(c) Remains open a definite time interval regardless of cause of opening.

(d) At the expiration of this time interval, if there is a short-circuit or overload on either side of the breaker, the breaker makes no attempt to reclose while the overload condition exists, but closes instantly upon the removal of short-circuit or overload.

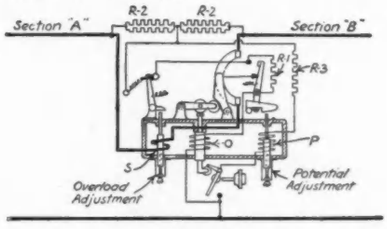


Fig. 4.

Referring to Fig. 3, it is seen that a resistance, called a bridging resistance, is connected around the breaker. To the mid-point of this bridging resistance are connected two coils designated as O and P. O is the operating coil and P is a controlling coil or potential coil. With the breaker in the open position a limited amount of current is by-passed around the open breaker through the bridging resistance. It is obvious, if a given voltage exists on one side of the breaker and a short-circuit exists on the other side that the voltage from the mid-point of the bridging resistance to earth or return will be one-half of the voltage on the feeder that is energised. Since the existence of the coils O and P are relatively high, as compared with that of the bridging resistance, the connection of these coils to the mid-point of the bridging resistance does not substantially change the value of voltage from this mid-point to return. If, therefore, E represents the voltage on the energised feeder and the other feeder is subject to a "short," the voltage across the controlling coil P is substantially E/2. Assume now that the short-circuit is entirely cleared. Then, bearing in mind that the resistance of the bridging resistance is negligible as compared with the very much higher resistance of the coils O and P, the voltage across the controlling coil P under this condition is substantially the same as the voltage of the energised feeder or E. With a voltage E on feeder A, it is obvious from the foregoing that between the condition of complete short-circuit and complete open circuit on feeder B the voltage across the controlling coil P will vary from the value of E/2 to E. The controlling coil P has an armature, the position of which is adjustable so that it may be set to respond to various values of voltage across the controlling coil P. The range of this adjustment is between the limits of E/2 and E so that the armature in this controlling coil may be set to respond to any desired condition on the feeder between complete short-circuit and complete open circuit. When the armature of the controlling coil P operates it closes the circuit of the operating coil O which closes the breaker.

If both sides of the breaker are energized the condition will be similar to that described above, in which one feeder is energized and the other feeder is partially cleared. The voltage at the mid-point of the bridging resistance in this case would be the mean of the voltages on the two sides, and would lie somewhere in the limits of E/2 and E, so that the same adjustment which was effective in picking up an independent feeder would serve to close the breaker when the feeders on both sides are energised.

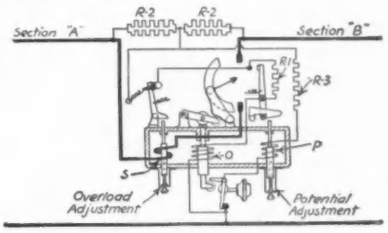


Fig. 5.

Figs. 4 and 5 (Igranic Electric Co.) are more complete diagrams of the circuits of a feeder breaker in closed and open positions respectively. S represents the series or overload coil; O and P, the operating and controlling coils, respectively, as before; R-2, one-half the bridging resistance; R-1, a resistance in series with the operating coil O; and R-3, a resistance in series with the controlling coil P. The purpose of resistance R-3 is merely to reduce the current through the controlling coil P, so that the operation of its armature will be within the proper voltage range. The function of resistance R-1 is to reduce the current through the operating coil O after the breaker has closed, so that the current through O will be sufficient to hold the breaker closed, though not sufficient to close the breaker. Inspection of the diagram will show that the operation of the armature in controlling coil P releases a latch, which in turn releases a contact which shunts resistance R-1, so that full voltage is applied to the operating coil O to close the breaker. The closing of the breaker, however, opens this shunt around resistance R-1, so that after the breaker is closed the current through the operating coil is only sufficient to hold if closed. An overload occurring on either section A or B will actuate the armature in the coil S and cause the contact above it in the circuit of the operating coil to be momentarily opened. This will cause the breaker to open and remain open until voltage and load conditions are proper to actuate the armature in the controlling coil P, which will cause the breaker to reclose in the manner described above. It will be observed that there is a contact in the circuit of the controlling coil P, which in Fig. 4 is opened and in Fig. 5 is closed. When the breaker opens, this contact closes against the retarding action of a dashpot, so that, regardless of voltage or load conditions, there is always a definite time interval provided between the opening and reclosing of the breaker. This time interval is adjustable by means of a needle-valve adjustment in the dashpot.

It will be observed that opening on voltage failure is an inherent characteristic of this breaker, inasmuch as voltage failure will result in de-energising the operating coil O quite as effectively as the opening of the operating circuit by action of the armature in the overload coil S.

Auto-reclose feeder breakers are provided with three adjustments; overload, reclosing and time interval.

Overload adjustment is made, depending upon the type of breaker, either by adjusting the height of a steel plunger in the series coil to the desired value indicated by the calibrations on a tube enclosing this plunger, or by adjusting the length of the air gap between a U-shaped magnet yoke surrounding the lower main contact and an armature pivoted to the lower pole of this magnet yoke.

The reclosing adjustment is made by adjusting the height of the armature in the controlling coil until the proper setting is

indicated on the calibrated bracket or tube enclosing the armature. This proper setting will be somewhere within the limits of line voltage and one-half line voltage, depending upon the load on which it is desired to have the breaker reclose.

The time interval during which the breaker must remain open is obtained by the means of an air bellows type of dashpot. A needle valve, through which the air escapes from this dashpot, forms a very convenient means of adjustment. Any time interval between one second and one minute or more can readily be obtained.

Recent Legal Decisions.

The House of Lords have reversed the decision of the Court of Session in *Oliver v. Sadler and Co.*, to which we have already referred. We may very briefly recall the facts. The action was at the instance of the representatives of a deck porter (appellants) who died from injuries received in discharging a ship at Leith Docks. The operation of discharging was a continuous one, done by two groups of employees of separate contractors—the stevedores and the porters. The injury to deceased was caused by the breaking of a defective rope, the property of the respondents, which formed the sling holding six bags of grain. The rope broke as the grain was being swung from the deck of the vessel to the quay, with the result that the bags fell on the deceased. In the case of a grain cargo the shipowners give delivery on to steelyards on the vessel's deck, where the bags are placed by the stevedores, who lift them from the hold; from the deck the porters take control and discharge the cargo on to the quay. The method adopted for this latter operation is at the discretion of the porters and depends in part on the tide and the height at which the vessel is riding. If the deck is above the quay it is obvious that the simplest method is to slide the bags down a gangway, but under different conditions, such as those which existed in the present case, the bags are slung from the deck to the quay by cranes belonging to the Leith Dock Commissioners. Although the operations of bringing the bags on to the deck and transferring them to the quay are distinct, there is one feature that remains throughout, and that is the grouping of the bags in sets. This is effected by the stevedores in the hold of the vessel, who provide the ropes necessary for the slings in which the sets are placed. These slings are never undone throughout the combined operations. The bags are hauled up by the stevedores and placed on the steelyards; the slings are then detached from the ship's derrick and hooked to the crane tackle and immediately slung ashore. It is in the interests of everyone concerned in the expeditious discharge of the cargo that these operations should be continuous. The ropes, which are provided by the stevedores, are thus used throughout, and this is the common and accepted practice. The danger due to imperfection in the ropes is well known, and the stevedores have a man whose business it is to make the slings and to examine these ropes before use—both those that are new and those that have been used. With him also lies the custody of the ropes; and so important is this constant supervision that the ropes are kept separate, the new ones being separated from those once used. It is, in fact, essential for the safety of all concerned that the ropes should be kept under constant examination to detect any weakness that might from time to time arise.

The Court of Session dismissed the claim on the ground that the stevedores owed no duty of protection to the porters, as they were charged with a distinctly different operation and were under a separate contract. The House of Lords, however, found otherwise. In their opinion, the nature of the operation itself was such that effective examination by the porters was almost impossible. "To examine the rope when the goods are taken off the steelyard would involve complete unloading of the set, and when the bags are released the rope is, in the ordinary course, withdrawn for the next consignment." In these circumstances the Court found that the porters relied on the stevedores to examine the ropes, that the stevedores knew that such reliance was placed on them, knew the danger, knew that, in the accepted course of unloading, the porters could not properly make the examination themselves, and did not make it, and that consequently they owed a duty to see that such examination was made with due care and skill. This duty, it was held, the stevedores had neglected, and the plaintiffs were therefore awarded damages.

It is extraordinary that the question which arose on Article 28 of the Collision Regulations in the case of the *Clan Stuart v. The Uskhaven*, House of Lords, 18th March, 1929, has not been previously considered. Article 28 provides that: "When vessels are in sight of one another, a steam vessel under way, in taking any course authorised or required by these rules, shall indicate that course by the following signals on her whistle or siren, viz.: one short blast to mean 'I am directing my course to starboard.'" And the question that immediately arises is whether such signals should be given by a vessel that is not answering her helm, or whether it is satisfied when a vessel intends to take a definite course and has put her helm and engines to satisfy that intention. In the Court of first instance, the Sheriff held that on the true construction of the Article it was wrong to answer a one-blast signal by another one-blast signal unless the ship's head was at the moment moving to starboard; the majority of the Judges of the Court of Session, on the other hand, were of opinion that the answer was justified if the necessary orders has been or were being given at the time of the signal. For the actual decision of the case it was not necessary to deal with the point, but Lord Sumner said: "If and when it arises, I should hesitate long before I could adopt a construction of what is, after all, an 'action signal' rule, which holds that it is complied with in a case where no direction of course to starboard takes place at all, merely because directions have been given from the bridge to helm and engines, though without result, especially in a case where the signal is not one which simply precedes the change in the ship's direction by a short interval, but is one where nothing follows the giving of the orders, so that the signal could convey no information of any use." The other Judges, however, expressly reserved their opinions on the point.

Is a motor boat carrying an excursion party a passenger steamer and so bound to be surveyed and certified? This was the point in *Young v. Docherty*, 1929 S.L.T. 253. The prosecutor rested his argument on the terms of the definition of "passenger steamer" in Section 267 of the Merchant Shipping Act: "Every British steamship carrying passengers to, from, or between any places in the United Kingdom." This definition heads the group of clauses of the Act which forms Part III., and Part III. deals with "Passenger and Emigrant Ships." Such vessels form an important branch of merchant shipping; and one would naturally understand the words of the definition to describe steamships actually engaged in the business of carrying passengers as distinct from steamers engaged in the business of carrying cargo. If the expression "passenger steamer" (as defined) bears this natural meaning, then the question whether the motor boats lent to the excursionists in the present case were, or were not, "passenger steamers" was largely a question of fact, upon which the prosecutor presented no evidence, and on that ground the case was dismissed. As the Lord President said: "I am not prepared on the facts before us in these cases and on the argument presented, to lay it down either expressly or by implication that, if the owner of a pleasure steam-vessel asks a party of friends, numbering more than twelve, to join him in a trip on the Clyde—say, from Greenock and back—his vessel becomes a 'passenger steamer' and his friends 'passengers' within the meaning of the Act to the effect of requiring him to qualify and apply for the statutory certificate. But this would be the result of affirming the prosecutor's bare argument on the terms of the Act."

NEW COAL HOISTS FOR LEITH.

Messrs. Vickers-Armstrongs, Ltd., have received from the Leith Harbour Commissioners an order for three 30-ton coal hoists for their Imperial and Edinburgh Docks.

The Commissioners have decided that one of these hoists shall be equipped with a "Norfolk Spade," an appliance specially designed for the rapid discharge of small coal or "duff" from wagons. This appliance, which is the invention of Mr. T. L. Norfolk, of Liverpool, will, with the three hoists, be manufactured at Elswick Works.

RIVER TRAFFIC ON WESER ABOVE BREMEN, DURING MAY.

The water conditions of the Weser in May were very unfavourable as a result of the great drought. Only with the assistance of the "Eder" reservoir, which, this spring, was never quite full, was it possible to maintain for the upper reaches during the second half of the month a depth of fully one metre, similar to the dry months of last year.

The average depth of water during May was 1.20 metres on the Upper Weser, the Middle Weser was even more shallow, barge loads had to be lightened upon entering the Weser from canals. These unfortunate conditions again clearly show the urgent necessity for more canals. The depth on the 1st of May between Minden and Bremen was 1.67 metres; on the last day of the month it was only 1.23 metres.

There was also a decrease in the total traffic on the Weser. This amounted to 219,000 tons, about 10,000 tons less than in April.

The downstream traffic which totalled 167,900 tons, was less by 18,700 tons than April figures. There was a decrease on all classes of goods, especially, however, on coal transport, which fell to 50,800 tons as against 57,900 tons in April and 78,500 tons the monthly average for 1928 in down-river traffic.

The up-river traffic from Bremen was somewhat better than in April, total 51,000 tons, an increase of 8,800. This was due to large increase of importation of English coal, also greater grain cargoes and phosphates in the upper Weser and the canals.

For the total Weser harbours in May the record figure of 56,900 tons was reached for importation of English coal, as against 23,000 tons, the monthly average for 1928.